

RESEARCH PAPER



Knowledge and acceptance of influenza and pertussis vaccinations among pregnant women of low socioeconomic status in Turkey

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ABSTRACT

Pregnant women and infants are at relatively high risk for influenza- and pertussis-related morbidity and mortality. Vaccination is the most important prevention strategy for both diseases. We evaluated knowledge and acceptance of influenza and pertussis vaccinations among pregnant women. We performed a cross-sectional survey of 465 pregnant women receiving prenatal care at the obstetric outpatient clinic in a tertiary medical center in Turkey between November 2015 and May 2016. We used a questionnaire investigating the knowledge of pertussis and influenza to evaluate potential influences on the acceptance or rejection of pertussis or influenza vaccinations. The acceptance rates of pertussis and influenza vaccinations were 11.2% and 19.8%, respectively. Maternal age, education level, employment status, number of gestations, and gestational age did not affect the rate of acceptance of these vaccinations. On the other hand, pregnant women who had a history of vaccination during their adolescence and in previous pregnancies were significantly more likely to accept pertussis vaccination. Knowledge about the risks of pertussis and influenza diseases for pregnant women and their children has a significant effect on vaccination acceptance. Even in low socioeconomic status groups, a recommendation for vaccinations by the primary obstetrician was significantly predictive of acceptance of both pertussis and influenza vaccination. This study revealed that the acceptance rates of pertussis and influenza vaccination among pregnant women are very low in Turkey. Healthcare worker recommendations and increased awareness about pertussis and influenza morbidity and mortality in pregnant women and infants are essential to improve the rates of vaccination acceptance during pregnancy.

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Introduction

Respiratory infections such as influenza and pertussis can cause severe complications, hospitalization, and even death for pregnant women and their infants. For pregnant women, this is believed to be mostly due to pregnancy-related immunosuppression that results in susceptibility and a decreased immune response to infection. Children under six months old have an immature immune system, resulting in decreased responses to viral and bacterial infections.^{1–4} Vaccinating pregnant women is one of the most effective measures to protect both pregnant women and their infants from these infections and their complications.^{5,6} Previous studies have shown that antenatal vaccination protects not only mothers but also their infants, who are too young for vaccination, from these diseases through the placental maternal-fetal transfer of antibodies.^{7–9}

The Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists (ACOG) recommend antenatal influenza vaccination at any gestational age to protect both mothers and their babies. Research has shown that influenza vaccination is relatively safe during pregnancy and effective at reducing adverse maternal, fetal, and neonatal outcomes.^{10,11} Since 2013, the

Advisory Committee on Immunization Practices (ACIP) and the CDC have recommended antenatal Tdap (tetanus, diphtheria, and acellular pertussis) vaccination during each pregnancy regardless of previous vaccination status.¹² Turkey does not include influenza and pertussis vaccinations in the national vaccination schedule for pregnant women. In Turkey, a few studies have been conducted to investigate the vaccination status of pregnant women and their children and the factors that affect this status.^{13–15} Despite these studies, there is little information available about pregnant women's awareness and acceptance of influenza and pertussis vaccinations in Turkey.

This study aimed to determine the level of knowledge and acceptance of influenza and pertussis vaccinations among pregnant women receiving prenatal care at a large metropolitan hospital in Istanbul, with the goal that better policies could be developed to improve vaccination acceptance during pregnancy by investigating the factors that affect acceptance.

Materials and methods

We performed a cross-sectional observational study using a 45-item questionnaire to evaluate participants' knowledge

of pertussis and influenza as well as the potential influencing factors regarding the acceptance or rejection of pertussis and influenza vaccinations. The participants for the study comprised pregnant women who were receiving routine prenatal care at an obstetric outpatient clinic in a tertiary medical center in Turkey between November 2015 and May 2016. Before starting the study, the questionnaire was piloted to 50 pregnant women at the same hospital. The study participants were randomly selected from the pool of those who completed the survey at the obstetric outpatient clinic. Signed informed consent was obtained from all participants. Each participant's name and signature were recorded on the informed consent form. The survey was developed from the current literature by the research team, and each survey was conducted face-to-face with all of the participants.

The survey contained questions on demographics, knowledge, attitudes, and beliefs regarding pertussis and influenza as well as pertussis and influenza vaccinations. The primary outcome of the survey was to determine whether pregnant women would accept influenza and pertussis vaccinations if offered. The demographic questions included in the survey comprised questions about age, marital status, education level, gestational age, number of gestations, and number of children. We also asked the participants whether they had researched prenatal care during their current pregnancy; when they first attended prenatal care; where they received

prenatal care; if (and why) they had any complications or needed hospitalization; and who in their family made their healthcare decisions. In terms of vaccinations, we asked whether or not vaccinations had been recommended to them; whether they planned to get any vaccinations in their current pregnancy; who/what had recommended tetanus, pertussis, and influenza vaccinations; what type of vaccines had been administered to them and when; and whether any post-vaccination complications had occurred. We also asked about their history of vaccinations during adolescence and previous pregnancies; how they perceived those who had recommended vaccines to them; and their reasons for accepting or rejecting pertussis and influenza vaccinations. In terms of knowledge, we asked whether they had heard about pertussis before; whether they believed that pregnant women and their babies are at risk of contracting pertussis and/or influenza; and whether pertussis and influenza vaccinations are safe and protective for pregnant women and their babies.

Statistical analyses

Data were entered into Microsoft Office Excel 2010 (Microsoft, Redmond, WA, USA). Statistical analysis was performed using SPSS version 22.0 (IBM, SPSS). Normally distributed data were assessed using means and the Student's t test. The significance of nonparametric data was assessed

Table 1. Demographic and clinical characteristics of pregnant women by intention to accept pertussis vaccination.

Variable	Intention to accept pertussis vaccination		p
	Yes n (%)	No n (%)	
Age <i>Mean±SS</i>	28,69 ± 5,67	27,75 ± 5,09	¹ ,216
Education level (n = 462)			² 0,227
	Elementary to high school	375 (89%)	
	Above high school	35 (8%)	
Marital status (n = 463)			² 0,168
	Married	409 (89%)	
	Single or divorced	2 (67%)	
Employment status (n = 465)			³ 0,452
	Housewife	318 (88%)	
	Other	95 (91%)	
Number of pregnancy <i>mean±SS</i>	2,38 ± 1,54	2,29 ± 1,29	⁴ 0,991
Number of children (n = 465)			² 0,054
	First pregnancy	149 (88%)	
	One	138 (91%)	
	Two	97 (77%)	
	Three	28 (97%)	
	Four	1 (33%)	
Children died of disease (n = 465)			⁵ 0,663
	Yes	34 (85%)	
	No	379 (89%)	
Prenatal care during pregnancy (n = 464)			³ 0,065
	Yes	52 (81%)	
	No	360 (90%)	
Site of prenatal care (n = 65)			² 0,364
	Family physician	8 (88%)	
	Public Hospital	35 (88%)	
	Private Hospital	10 (100%)	
Health problems during pregnancy (n = 410)			⁵ 0,089
	Yes	93 (84%)	
	No	268 (90%)	
Hospitalization during pregnancy (n = 465)			⁶ 0,243
	Yes	18 (100%)	
	No	395 (88%)	
Trimester of gestation (n = 465)			⁵ 0,568
	1st trimester	43 (86%)	
	2 nd trimester	273 (90%)	
	3 rd trimester	97 (88%)	
Person who decided about seeking healthcare in family? (n = 465)			⁵ 0,255
	Myself	84 (87%)	
	My husband	42 (82%)	
	Together (myself and husband)	276 (90%)	
	Other	11 (100%)	

¹Student's t test

²Fisher Freeman Halton test

³Yates's continuity correction

⁴Mann Whitney U test

⁵Chi-square test

⁶Fisher's Exact test

Table 2. Demographic and clinical characteristics of pregnant women by intention to accept influenza vaccination.

Variable	Intention to accept influenza vaccination		p	
	Yes	No		
	n (%)	n (%)		
Age <i>Mean±SS</i>	28,07 ± 6,02	27,8 ± 4,93	¹ 0,704	
Education level (n = 462)	Elementary to high school	87 (21%)	334 (79%)	² 0,522
	Above high school	5 (12%)	36 (88%)	
Marital status (n = 463)	Married	92 (20%)	368 (80%)	² 1,000
	Single or divorced	0 (0%)	3 (100%)	
Employment status (n = 465)	Housewife	75 (21%)	286 (79%)	³ 0,390
	Other	17 (16%)	87 (84%)	
Number of pregnancy <i>mean±SS</i>	2,47 ± 1,43	2,26 ± 1,29	⁴ 0,297	
Number of children (n = 465)	First pregnancy	35 (21%)	134 (79%)	⁵ 0,223
	One	25 (16%)	127 (84%)	
	Two	23 (21%)	89 (79%)	
	Three	7 (24%)	22 (76%)	
	Four	2 (67%)	1 (33%)	
Children died of disease (n = 465)	Yes	11 (28%)	29 (72%)	⁵ 0,253
	No	81 (19%)	344 (81%)	
Prenatal care during pregnancy (n = 464)	Yes	20 (31%)	44 (57%)	⁵ 0,014*
	No	72 (18%)	328 (82%)	
Site of prenatal care (n = 65)	Family physician	4 (40%)	6 (60%)	² 0,654
	Public Hospital	14 (31%)	31 (69%)	
	Private Hospital	2 (20%)	8 (80%)	
Health problems during pregnancy (n = 465)	Yes	34 (31%)	77 (69%)	⁵ 0,004*
	No	58 (16%)	296 (84%)	
Hospitalization during pregnancy (n = 465)	Yes	5 (2%)	13 (72%)	⁶ 0,371
	No	87 (19%)	360 (81%)	
Trimester of gestation (n = 465)	1st trimester	10 (20%)	40 (80%)	⁵ 0,498
	2nd trimester	34 (11%)	271 (89%)	
	3rd trimester	14 (13%)	96 (87%)	
Person who decided about seeking healthcare in family (n = 465)	Myself	21 (22%)	75 (88%)	⁵ 0,496
	My husband	13 (25%)	38 (75%)	
	Together (myself and husband)	57 (19%)	250 (81%)	
	Other	1 (9%)	10 (91%)	

¹Student's t test²Fisher Freeman Halton test³Yates's continuity correction⁴Mann Whitney U test⁵Chi-square test⁶Fisher's Exact test

using the Mann–Whitney U test. The statistical significance of dichotomous outcomes was determined using the chi-square test, Fisher's exact test, the Fisher–Freeman–Halton test, and Yates's continuity correction. A multivariate logistic regression analysis was performed. A value of $p < .05$ was considered statistically significant. The Ethics Committee at Marmara University School of Medicine approved this study.

Results

Demographic and clinical characteristics

A total of 465 pregnant women participated in the survey. Among these participants, 52 (11.2%) accepted pertussis vaccinations and 92 (19.8%) accepted influenza vaccinations during pregnancy if offered. The mean age of the participants was 27.8 years (age range: 17–42 years). More than half of the women were housewives (77.6%). Almost all participants were married (98.9%). The majority of participants (63.9%) had high-school education only, and just 8.8% of participants had university-level education. At the time of the survey, 65% of the women were in their second trimester and 24% in their third trimester. Only 64 (14%) participants reported seeking antenatal care during their current pregnancy. In total, 24% of participants reported having general health problems during their pregnancy. Participants who were seeking antenatal care

during pregnancy were significantly more likely to accept influenza vaccinations ($p = .014$). No other demographic or clinical characteristics had a significant effect on the acceptance of influenza and pertussis vaccinations (Tables 1 and 2).

Influenza and pertussis knowledge, vaccine recommendations, administration history, and vaccination acceptance

Participants who had a history of pertussis vaccinations during their adolescence or previous pregnancies were significantly more likely to accept a pertussis vaccination ($p = .01$ and $p = .013$, respectively) (Table 3). However, a history of influenza vaccinations during childhood, adolescence, or prior pregnancy did not affect influenza vaccination acceptance during pregnancy. In terms of the vaccines administered during prior pregnancies, 171 (37%) participants received a tetanus vaccine, and just one received a tetanus and influenza vaccine. Just 24 (5%) participants had heard of pertussis. Those who had heard of pertussis and influenza and believed maternal vaccines to be safe were significantly more likely to accept pertussis and influenza vaccinations. Those who agreed that they and their babies were at risk of contracting pertussis and influenza and that their babies would be protected by their vaccination were also significantly more likely to accept pertussis and influenza vaccinations. However, no significant association was found between a history of

Table 3. Vaccination history, pertussis disease knowledge, vaccine recommendation by intention to accept pertussis vaccination.

		Intention to accept pertussis vaccination		p
		Yes	No	
		n (%)	n (%)	
Previous DTP vaccination in childhood or adolescence (n = 465)	Yes	7 (33%)	14 (67%)	¹ 0,001*
	No	14 (15%)	78 (85%)	
	Not sure	31 (8%)	321 (92%)	
Vaccination during prior pregnancies (n = 458)	Yes	27 (16%)	145 (84%)	¹ 0,013*
	No	6 (8%)	66 (92%)	
	Not sure	2 (2%)	81 (98%)	
Received vaccines in previous pregnancies (n = 172)	First pregnancy	15 (11%)	116 (89%)	² 0,157
	Tetanus	26 (15%)	145 (85%)	
	Tetanus+influenza	1 (100%)	0 (0%)	
Adverse vaccine reaction history (n = 172)	Yes	3 (42%)	4 (58%)	³ 0,090
	No	23 (16%)	124 (84%)	
	Not sure	1 (6%)	17 (94%)	
Hospitalization for vaccine-induced complications (n = 172)	Yes	1 (100%)	0 (0%)	³ 0,065
	No	26 (16%)	135 (84%)	
	Not sure	0 (0%)	10 (100%)	
Have you ever heard of pertussis? (n = 465)	Yes	10 (42%)	14 (58%)	¹ 0,000*
	No	37 (12%)	271 (88%)	
	Not sure	5 (9,6%)	128 (93,1%)	
Pregnant women should be vaccinated against pertussis (n = 465)	Yes	34 (92%)	3 (8%)	¹ 0,000*
	No	2 (3%)	73 (97%)	
	Not sure	16 (5%)	337 (95%)	
Pertussis unvaccinated women can develop pertussis (n = 465)	Yes	11 (27%)	30 (73%)	³ 0,002*
	No	0 (0%)	24 (100%)	
	Not sure	41 (10%)	359 (90%)	
Did you receive a recommendation for any vaccine during pregnancy? (n = 465)	Yes	32 (15%)	219 (85%)	¹ 0,498
	No	15 (9%)	150 (81%)	
	Not sure	5 (10%)	44 (90%)	
Is it safe pertussis vaccination for pregnant women? (n = 465)	Yes	14 (54%)	12 (46%)	³ 0,000*
	No	0 (0%)	27 (100%)	
	Not sure	38 (9%)	374 (91%)	
Can your baby get pertussis? (n = 465)	Yes	8 (31%)	18 (69%)	³ 0,011*
	No	2 (7%)	25 (93%)	
	Not sure	42 (10%)	370 (90%)	
Can infants protect from pertussis if their mothers gets a pertussis vaccine during pregnancy? (n = 465)	Yes	9 (30%)	21 (70%)	³ 0,007*
	No	1 (6%)	17 (94%)	
	Not sure	42 (10%)	375 (90%)	
Did you plan to get any vaccines in current pregnancy? (n = 465)	Yes	34 (15%)	195 (85%)	¹ 0,039*
	No	10 (9%)	102 (91%)	
	Not sure	8 (6%)	116 (94%)	

¹Chi-square test²Fisher's Exact test³Fisher Freeman Halton test

*p < .05

influenza vaccinations during adolescence or previous pregnancies and influenza vaccination acceptance. Participants who understood that pertussis vaccinations during pregnancy can prevent infant infection had a high rate of pertussis vaccinations. As expected, those who were either planning to get vaccinated during pregnancy or agreed that pregnant women should be vaccinated against pertussis were significantly more likely to accept pertussis vaccinations ($p = .039$ and $p = .000$, respectively) (Tables 3 and 4).

Reasons to accept pertussis and influenza vaccinations

Among the reasons for the participants accepting pertussis vaccinations were due to the recommendations of a doctor (obstetrician or pediatrician), healthcare worker, Turkish Ministry of Health worker, or international organization worker. These recommendations were significantly associated with pertussis vaccination acceptance. However, only the recommendation of an obstetrician was significantly associated with influenza vaccination acceptance.

No other factors led to influenza and pertussis vaccination acceptance (Tables 5 and 6).

Multivariate analysis for pertussis and influenza vaccination acceptance

In the multivariate analysis, we detected independent associations between pertussis vaccination acceptance and a history of pertussis vaccination during adolescence (OR = 7,395; 95% CI: 1,635–33,453), a history of pertussis vaccination during previous pregnancies (OR = 3,147; 95% CI: 1,107–8,946), and unvaccinated women identified as most likely to get pertussis (OR = 6,425; 95% CI: 1,668–24,739).

We also detected significant associations between influenza vaccination acceptance and knowledge among participants that getting vaccinations when pregnant can protect their babies from disease (OR = 3,265; 95% CI: 1,393–7,657).

No the other variables demonstrated a significant effect on vaccination acceptance rates in the multivariate analysis (Tables 7 and 8).

Table 4. Vaccination history, influenza disease knowledge, vaccine recommendation by intention to accept influenza vaccination.

		Intention to accept influenza vaccination		p
		Yes	No	
		n (%)	n (%)	
Previous DTP vaccination in childhood or adolescence (n = 465)	Yes	6 (29%)	15 (71%)	¹ 0,184
	No	23 (25%)	69 (75%)	
	Not sure	63 (18%)	289 (82%)	
Vaccination during prior pregnancies (n = 458)	Yes	39 (23%)	133 (77%)	¹ 0,070
	No	17 (24%)	55 (76%)	
	Not sure	8 (10%)	75 (90%)	
Received vaccines in previous pregnancies (n = 172)	First pregnancy	25 (11%)	106 (89%)	² 1,000
	Tetanus	39 (23%)	132 (77%)	
	Tetanus+influenza	0 (0%)	1 (100%)	
Adverse vaccine reaction history (n = 172)	Yes	2 (29%)	5 (71%)	³ 0,713
	No	34 (23%)	113 (77%)	
	Not sure	3 (17%)	15 (83%)	
Hospitalization for vaccine-induced complications (n = 172)	Yes	0 (0%)	1 (100%)	³ 1,000
	No	37 (23%)	124 (77%)	
	Not sure	2 (20%)	8 (80%)	
Have you ever heard of influenza? (n = 465)	Yes	61 (25%)	181 (75%)	¹ 0,000*
	No	21 (22%)	76 (88%)	
	Not sure	10 (8%)	116 (92%)	
Pregnant women should be vaccinated against influenza (n = 465)	Yes	59 (73%)	22 (27%)	¹ 0,000*
	No	9 (7%)	119 (93%)	
	Not sure	24 (9%)	232 (81%)	
Influenza unvaccinated women can develop influenza (n = 465)	Yes	37 (30%)	85 (70%)	¹ 0,002*
	No	6 (22%)	22 (78%)	
	Not sure	49 (26%)	266 (84%)	
Did you receive a recommendation for any vaccine during pregnancy? (n = 465)	Yes	55 (22%)	196 (88%)	¹ 0,449
	No	28 (17%)	137 (83%)	
	Not sure	9 (18%)	40 (82%)	
Is it safe influenza vaccination for pregnant women? (n = 465)	Yes	11 (69%)	5 (31%)	¹ 0,000*
	No	4 (11%)	34 (89%)	
	Not sure	77 (19%)	334 (81%)	
Can your baby get influenza? (n = 465)	Yes	27 (35%)	51 (65%)	¹ 0,001*
	No	5 (20%)	20 (80%)	
	Not sure	60 (17%)	302 (83%)	
Can infants protect from influenza if their mothers gets a influenza vaccine during pregnancy? (n = 465)	Yes	21 (55%)	17 (45%)	¹ 0,000*
	No	5 (14%)	30 (86%)	
	Not sure	66 (17%)	326 (83%)	
Did you plan to get any vaccines in current pregnancy? (n = 465)	Yes	53 (23%)	176 (77%)	¹ 0,105
	No	22 (20%)	90 (80%)	
	Not sure	17 (14%)	107 (86%)	

¹ Chi-square test² Fisher's Exact test³ Fisher Freeman Halton test

*p < .05

Discussion

In this study, acceptance rates of pertussis and influenza vaccines were 11.2% and 19.8%, respectively. This outcome suggests that vaccinations during pregnancy pose a particular challenge. Despite the importance of maternal immunization against pertussis and influenza in both pregnant women and their babies, vaccine acceptance rates are low, even in developed countries.¹⁶⁻¹⁹ In a cross-sectional survey of 402 pregnant women, Varan et al. reported that 57% of participants accepted pertussis vaccination if offered.¹⁷ In another study, D'Alessandro et al. reported that none of the participants accepted the Tdap vaccination and that just 1.4% of participants accepted the influenza vaccination during pregnancy.¹⁸ In a cross-sectional survey of 198 pregnant Turkish women, Celikel et al. demonstrated that only 3% of pregnant women received a seasonal influenza vaccination.¹³ Similar to these studies, we found the rates of pertussis and influenza vaccination acceptance among pregnant women to be very low. It is necessary to determine the reasons for these low vaccination rates so that better strategies can be developed to improve vaccination acceptance during pregnancy.

Numerous studies in the extant literature have evaluated the factors associated with vaccination acceptance during pregnancy. A recent study by Ben Natan et al. conducted on pregnant Israeli women reported that native-born women were more likely to express an intention to be vaccinated.²⁰ In a cross-sectional observational study of pregnant women, Khan et al. showed that pregnant women with more than three children were significantly less likely to accept influenza vaccinations.²¹ In another study, Hu et al. reported that the demographic characteristics were significantly different between pregnant women who accepted and did not accept the influenza vaccination.²² We found that no demographic or clinical factors had a significant effect on influenza and pertussis vaccination acceptance. This may be explained by the fact that our sample mostly consisted of housewives of low socioeconomic status.

In this study, only 24 (5%) participants had heard of pertussis and only 26 (5.5%) knew that babies can contract pertussis. Thus, knowledge and awareness of pertussis was very low in our study population. We found that if pregnant women had knowledge of pertussis and knowledge of the risk

Table 5. Reasons to accept pertussis vaccination during pregnancy.

	Intention to accept pertussis vaccination		p
	Yes	No	
	n (%)	n (%)	
If a obstetrician recommends a pertussis vaccination	31 (16%)	159 (84%)	¹ 0,004*
If a pediatrician recommends a pertussis vaccination	13 (38%)	21 (62%)	² 0,000*
If a another healthcare worker (e.g. nurse) recommends a pertussis vaccination	3 (60%)	2 (40%)	² 0,011*
If Turkey Ministry of Health recommends a pertussis vaccination	11 (26%)	32 (74%)	² 0,004*
If an international organization (e.g. WHO) recommends a pertussis vaccination	8 (50%)	8 (50%)	² 0,000*
If there is a pertussis case in the neighborhood	1 (11%)	8 (89%)	² 1,000
If there is a pertussis case in the city	1 (17%)	5 (83%)	² 0,511
If there is a pertussis case in the country	3 (30%)	7 (70%)	² 0,090
If a friend or relative recommends a pertussis vaccination	0 (0%)	1 (100%)	² 1,000
Other reasons	1 (9%)	10 (91%)	² 0,567
I don't want to answer	15 (6%)	216 (94%)	³ 0,002*

¹ Chi-square test²Fisher's Exact test³Yates's continuity correction

*p < .05

Table 6. Reasons to accept influenza vaccination during pregnancy.

	Intention to accept influenza vaccination		p
	Yes	No	
	n (%)	n (%)	
If a obstetrician recommends a influenza vaccination	66 (16%)	136 (84%)	¹ 0,000*
If a pediatrician recommends a influenza vaccination	12 (38%)	24 (62%)	² 0,057
If a another healthcare worker(e.g. nurse) recommends a influenza vaccination	4 (60%)	4 (40%)	³ 0,053
If Turkey Ministry of Health recommends a influenza vaccination	10 (26%)	23 (74%)	² 0,178
If an international organization (e.g. WHO) recommends a p influenza vaccination	4 (50%)	10(50%)	³ 0,492
If there is a influenza case in the neighborhood	0 (11%)	2 (89%)	³ 1,000
If there is a influenza case in the city	0 (17%)	2 (83%)	³ 1,000
If there is a p influenza case in the country	1 (30%)	3 (70%)	³ 0,587
If a friend or relative recommends a influenza vaccination	1 (0%)	0 (100%)	³ 0,198
Other reasons	4 (9%)	9 (91%)	² 0,567
I don't want to answer	17 (6%)	212 (94%)	² 0,000*

¹ Chi-square test²Fisher's Exact test³Yates's continuity correction

*p < .05

Table 7. Multivariate logistic regression analyses examining factors affecting pertussis vaccination acceptance.

	OR	SE	p	95% CI
Previous DTP vaccination in childhood or adolescence	7,395	0,77	0,009	1,635–33,453
Vaccination during prior pregnancies	3,147	0,533	0,032	1,107–8,946
Have you ever heard of pertussis?	0,926	0,937	0,934	0,147–5,811
If a obstetrician recommends a pertussis vaccination	0,547	0,794	0,447	0,115–2,591
If a pediatrician recommends a pertussis vaccination	2,484	0,872	0,297	0,45–13,722
If a another healthcare worker (e.g. nurse) recommends a pertussis vaccination	7,39	1,481	0,177	0,406–134,632
If Turkey Ministry of Health recommends a pertussis vaccination	2,976	0,716	0,128	0,731–12,11
If an international organization (e.g. WHO) recommends a pertussis vaccination	2,095	0,964	0,443	0,317–13,865
Pertussis unvaccinated women can develop pertussis	6,425	0,688	0,007	1,668–24,739
Can infants protect from pertussis if their mothers gets a pertussis vaccine during pregnancy?	0,402	0,853	0,285	0,075–2,139
Is it safe pertussis vaccination for pregnant women?	3,685	0,958	0,173	0,563–24,11

it poses to babies, they were more likely to accept pertussis vaccinations during pregnancy. Moreover, knowledge about the safety and protection that the pertussis vaccine offers

Table 8. Multivariate logistic regression analyses examining factors affecting influenza vaccination acceptance.

	OR	SE	p	95% CI
Have you ever heard of influenza?	1,046	0,343	0,896	0,534–2,048
If a obstetrician recommends an influenza vaccination	0,672	0,502	0,428	0,252–1,796
Influenza unvaccinated women can develop influenza	1,27	0,348	0,492	0,642–2,511
Can infants protect from influenza if their mothers gets a influenza vaccine during pregnancy?	3,265	0,435	0,006	1,393–7,657
Is it safe influenza vaccination for pregnant women?	2,142	0,837	0,363	0,415–11,053

babies was shown to have a positive influence on pertussis vaccination acceptance during pregnancy. However, the acceptance of the influenza vaccination during pregnancy was mainly affected by knowledge about the disease itself, the safety of the vaccine, and protection for the baby. Our findings suggest that increased awareness and knowledge of these diseases can improve pertussis and influenza vaccination acceptance during pregnancy. Prior studies have also demonstrated the association between awareness of the diseases and vaccine acceptance.^{17,23–26} In a convenience survey of pregnant women, Healy et al. reported that the most important factors associated with vaccination acceptance were safety for

the baby and mother, sufficient information, and adequate vaccine education, with mean scores of 4.7, 4.5, and 4.2, respectively, on a 5-point scale.²³ In another study, Pathirana et al. showed that increased knowledge in patients is one of the most important factors affecting vaccination acceptance during pregnancy.²⁴ McCarty et al. also reported extremely low awareness of the benefits of influenza vaccinations during pregnancy.²⁵

Our study determined different factors that influence both pertussis and influenza vaccination acceptance during pregnancy. We showed that influenza and pertussis vaccination acceptance is higher if the vaccination is recommended by the pregnant woman's primary obstetrician. Consistent with previous studies, this study demonstrated the important role that healthcare workers can play in improving vaccination acceptance during pregnancy.^{23,27,28} A recent study by Strassberg et al. reported that the recommendations of healthcare workers, in combination with educational materials, have a significant effect on both Tdap and influenza vaccination acceptance.²⁷ In another recent study, Arriola et al. showed that pregnant women who were recommended vaccinations by their healthcare workers were significantly more likely to accept influenza vaccinations.²⁸ The findings from these studies show that education, when coupled with vaccine recommendations made by healthcare workers, could improve the rate of vaccination coverage during pregnancy. Previous studies reported that pregnant women's safety and efficacy concerns were the most common reasons for vaccination rejection.^{17,21,29} Educational programs might improve vaccination acceptance during pregnancy by emphasizing vaccine safety and efficacy.^{29,30} Previous studies conducted on different demographic groups have shown that the recommendations of healthcare workers are positively associated with vaccination acceptance.³¹⁻³⁴

This study has several limitations. First, the study was conducted in one medical center rather than in multiple centers, meaning that generalizing the study's findings to Turkey's wider population should be done with caution. Second, the results were based on self-reported information about the knowledge and acceptance of vaccinations. The participants' medical and immunization records were unavailable. Third, the majority of the participants were housewives of low socioeconomic status. Thus, the findings may not be applicable to all pregnant women.

To conclude, our findings highlight the important role that healthcare workers can play, in conjunction with increased knowledge about pertussis and influenza, in improving vaccination acceptance during pregnancy. Efforts to educate pregnant women and healthcare workers may improve pertussis and influenza vaccination acceptance during pregnancy.

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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