ORIGINAL RESEARCH
Family Medicine

Doi:10.29228/ejhh.88539
EurJHumHealth2025;4(6):102-110

Pregnant Women's Tetanus and Tdap Vaccination Status and Awareness

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Abstract

Aim: This study aimed to evaluate tetanus vaccination status and awareness among pregnant women, to assess knowledge and attitudes regarding tetanus and tetanus–diphtheria–acellular pertussis (Tdap) vaccination, and to examine the association between sources of information and awareness of the Tdap vaccine.

Methods: This observational, descriptive, cross-sectional study was conducted among pregnant women attending the Pregnant Outpatient Clinic of a tertiary hospital between 15 and 30 October 2023. Pregnant women in their second or third trimester who provided written informed consent were included. Data were collected through face-to-face interviews using a structured questionnaire covering sociodemographic characteristics, obstetric history, vaccination status, sources of information, and awareness of tetanus and Tdap vaccination. Descriptive statistics and chi-square tests were used for data analysis.

Results: A total of 72 pregnant women were included in the study. Awareness of the need for tetanus vaccination during pregnancy was high (90.3%); however, only 54.2% had received tetanus vaccination during the current pregnancy. The family health care center was the most common vaccination site (50.0%). Awareness of booster doses after childbirth was reported by 37.5% of participants. Awareness of the Tdap vaccine was low (16.7%), and only 37.5% expressed willingness to receive the Tdap vaccine. Family physicians were the primary source of information regarding tetanus and Tdap immunization (79%). A statistically significant association was found between the source of vaccine-related information and awareness of the Tdap vaccine, with higher awareness among women informed by family physicians ($p = 0.022$).

Conclusions: Despite high awareness of tetanus vaccination during pregnancy, vaccination coverage and awareness of the Tdap vaccine remain suboptimal among pregnant women. Family physicians play a pivotal role in improving vaccine awareness, particularly for Tdap vaccination. Strengthening provider-led counseling within routine antenatal care may improve maternal immunization uptake.

Keywords: Pregnancy; Tetanus vaccination; Tdap; Maternal immunization; Vaccine awareness; Primary health care

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Received: 23.11.2025 **Accepted:** 29.12.2025

Cite this article as: Sakarya D., Com Aybal N., Erdem F. & Arica S. Pregnant Women's Tetanus and Tdap Vaccination Status and Awareness Eur J Hum Health.2025;4(6):102-110.

Introduction

Maternal immunization constitutes an essential component of comprehensive antenatal care, aiming to protect both pregnant women and their infants from vaccine-preventable infectious diseases [1,2]. Among these, tetanus remains a serious and potentially fatal condition, particularly affecting populations with inadequate immunization coverage [1]. Maternal tetanus vaccination during pregnancy provides direct protection to the mother and facilitates passive transfer of protective antibodies to the fetus, thereby reducing the risk of neonatal tetanus, which continues to contribute to neonatal morbidity and mortality worldwide despite global elimination efforts [1–3].

The World Health Organization (WHO) recommends routine tetanus vaccination for all pregnant women as part of standard antenatal care, emphasizing its role in preventing maternal and neonatal tetanus [1,3]. In many countries, including Türkiye, tetanus vaccination has been incorporated into national immunization programs and is delivered free of charge through primary health care services [4,5]. Nevertheless, achieving and sustaining optimal vaccination coverage remains challenging. Disparities in vaccination uptake have been linked to multiple factors, including limited awareness, delayed initiation of antenatal care, misconceptions regarding vaccine safety, and inconsistent counseling by health care providers [6–8].

In addition to tetanus vaccination, the tetanus–diphtheria–acellular pertussis (Tdap) vaccine has gained increasing importance in maternal immunization strategies over the past decade [9,10]. Pertussis poses a significant risk to young infants, particularly during the first months of life before completion of the primary vaccination series [9]. Maternal Tdap vaccination during pregnancy has been shown to effectively reduce pertussis-related morbidity and mortality in newborns through transplacental antibody transfer [10–12]. Consequently, international authorities such as the WHO, the Centers for Disease Control and Prevention (CDC), and the European Centre for Disease Prevention and Control (ECDC) recommend routine administration of Tdap during pregnancy, preferably in the late second or third trimester [9–11].

Despite strong evidence supporting its effectiveness, uptake of the Tdap vaccine among pregnant women remains suboptimal in many settings [6,12,13]. Studies have consistently reported low levels of awareness and limited knowledge regarding the purpose, timing, and benefits of Tdap vaccination [6,7,13]. Commonly reported barriers include insufficient information, fear of adverse effects on the fetus, mistrust toward vaccines, financial concerns in settings where the vaccine is not universally covered, and lack of recommendation from health care professionals [7,8,14].

Health care providers, particularly family physicians and obstetricians, play a central role in promoting maternal immunization [6,15]. Previous research has demonstrated that a clear recommendation from a trusted health care provider is one of the strongest predictors of vaccine acceptance during pregnancy [6,15]. Primary health care centers, where routine antenatal follow-up and vaccination services are often delivered, represent a critical point of contact for educating pregnant women, addressing vaccine hesitancy, and ensuring timely immunization [4,5,15]. Understanding which sources of information most strongly influence pregnant women’s awareness and decision-making is therefore essential for designing targeted interventions to improve vaccination uptake.

Accordingly, the present study aimed to evaluate tetanus vaccination status and awareness among pregnant women, to assess knowledge and attitudes related to tetanus and Tdap vaccination, and to examine the association between sources of information and awareness of the Tdap vaccine. By identifying gaps in knowledge, vaccination practices, and information pathways, this study seeks to contribute evidence that may support targeted interventions to strengthen maternal immunization programs within routine prenatal care.

Methods

Ethical Approval

Ethical approval for this study was obtained from the Prof Dr Cemil Taşçıoğlu City Hospital Clinical Research Ethics Committee at its meeting held on 09/10/2023 (Decision No: 202).

Study Design and Participants

This study was designed as an observational, descriptive, cross-sectional study. It was conducted among women who applied to the Pregnant Outpatient Clinic of Prof Dr Cemil Taşçıoğlu City Hospital between 15/10/2023 and 30/10/2023. Eligible participants were pregnant women in their second or third trimester who voluntarily agreed to participate after receiving information about the study and providing written informed consent.

Women who declined participation or who were not pregnant at the time of the interview were excluded from the study.

Data Collection

After obtaining written informed consent, data were collected through face-to-face interviews using a structured questionnaire developed by the researchers. The questionnaire consisted of 25 items covering the following domains:

Sociodemographic characteristics (age, education level, employment status, spouse's education and employment status, and income level)

Obstetric characteristics (current gestational week, number of pregnancies, number of births, and history of miscarriage or stillbirth)

Prenatal care and education status

Knowledge regarding the need for tetanus vaccination during pregnancy

Sources of information about vaccination

Tetanus vaccination status during the current pregnancy and gestational week(s) at which vaccination was administered

Health care setting where vaccination was performed

Reasons for not receiving tetanus vaccination

Tetanus vaccination status in previous pregnancies

Awareness of the need for continuation of tetanus vaccination after childbirth

Awareness of the Tdap (tetanus–diphtheria–acellular pertussis) vaccine

Willingness to receive the Tdap vaccine and reasons for refusal, if applicable

Whether participants were contacted by a physician or nurse at their registered family health care center to remind them about tetanus vaccination

Statistical Analysis

Normality of continuous variables was assessed using the Shapiro–Wilk test. Continuous variables were not compared between groups; therefore, no parametric or non-parametric tests were applied for continuous data. Descriptive statistics were presented as number and percentage for categorical variables, mean ± standard deviation for normally distributed continuous variables, and median (minimum–maximum) for non-normally distributed variables.

Comparisons of proportions between independent groups were performed using the chi-square test. When a statistically significant chi-square result was observed, pairwise comparisons were conducted using adjusted p-values to control for multiple testing. In addition, univariable logistic regression analysis was performed to explore the association between selected sociodemographic variables and willingness to receive the Tdap vaccine. Results were expressed as odds ratios (ORs) to describe the direction of associations. Statistical analyses were carried out using IBM Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA), and a p value of <0.05 was considered statistically significant.

Results

A total of 72 pregnant women were included in the study. The sociodemographic characteristics of the participants are presented in Table 1. Most participants had completed primary school (37.5%) or university education (31.9%). Nearly

half of the participants reported a monthly income lower than their expenses (48.6%). The majority of the women were unemployed (72.2%), and 69.4% reported having received prenatal care education.

Table 1. Sociodemographic characteristics of the participants (n = 72)

Variable	Category	n	%
Education level	Illiterate	4	5.6
	Literate	2	2.8
	Primary school graduate	27	37.5
	High school graduate	16	22.2
	University graduate	23	31.9
Spouse's education level	Illiterate	2	2.8
	Literate	1	1.4
	Primary school graduate	27	37.5
	High school graduate	21	29.2
	University graduate	21	29.2
Monthly income status	Income less than expenses	35	48.6
	Income equal to expenses	26	36.1
	Income more than expenses	11	15.3
Employment status	Employed	20	27.8
	Unemployed	52	72.2
Received prenatal care education	Yes	50	69.4
	No	22	30.6

The mean age of the participants was 28.7 ± 5.38 years, with a median age of 28 years (range: 19–42). The median number of pregnancies was 2 (range: 1–7), and the median number of births was 1 (range: 0–5). The median gestational age at the time of participation was 25 weeks (range: 14–38). Among women who received tetanus vaccination during pregnancy, the first dose was administered at a median gestational week of 20 (range: 16–30), and the second dose at a median gestational week of 24.5 (range: 20–28) (Table 2).

Table 2. Demographic characteristics, pregnancy information, and timing of tetanus vaccination

Variable	n	Mean ± SD	Median (Min-Max)
Age (years)	72	28.7 ± 5.38	28 (19–42)
Number of pregnancies	72	2.37 ± 1.46	2 (1–7)
Gestational age (weeks)	72	25.6 ± 7.24	25 (14–38)
Number of births	72	1.04 ± 1.18	1 (0–5)
Gestational week at first dose of tetanus vaccine	39	21.17 ± 3.22	20 (16–30)
Gestational week at second dose of tetanus vaccine	12	24.7 ± 2.30	24.5 (20–28)

Awareness of the need for tetanus vaccination during pregnancy was high, with 90.3% of participants reporting that they were aware of this recommendation. However, only 54.2% had received tetanus vaccination during the current pregnancy. Among vaccinated women, the most common vaccination site was the family health care center (50.0%). Regarding previous tetanus immunization status, 30.6% had completed the five-dose vaccination schedule, while 29.2% had been vaccinated before pregnancy but had an incomplete schedule and received one dose during the current pregnancy. Awareness of booster doses after childbirth was reported by 37.5% of participants. Awareness of the Tdap vaccine was low (16.7%), and only 37.5% expressed willingness to receive the Tdap vaccine. In univariable logistic regression analysis, higher income level was associated with increased willingness to receive the Tdap vaccine, consistent with the findings of the chi-square analysis. Most participants (79.2%) reported being reminded about tetanus vaccination by their registered primary health care center (Table 3).

Table 3. Tetanus vaccination status and awareness among pregnant women

Variable	Response	n	%
Awareness of tetanus vaccination during pregnancy	Yes	65	90.3
	No	7	9.7
Received tetanus vaccination during current pregnancy	Yes	39	54.2
	No	33	45.8
Place of tetanus vaccination	Family health care center	36	50.0
	Government hospital	2	2.8
	Private hospital	1	1.4
Previous tetanus immunization status	5-dose vaccination schedule completed	22	30.6
	Previously unvaccinated, received two doses during pregnancy	7	9.7
	Previously vaccinated, received one dose during pregnancy	12	16.7
	Previously unvaccinated, not vaccinated during pregnancy	8	11.1
	Vaccinated before pregnancy but schedule incomplete, received one dose during pregnancy	21	29.2
	Vaccinated before pregnancy but schedule incomplete, not vaccinated during pregnancy	2	2.8
Awareness of booster doses after childbirth	Yes	27	37.5
	No	45	62.5
Awareness of Tdap vaccine	Yes	12	16.7
	No	60	83.3
Willingness to receive Tdap vaccine	Yes	27	37.5
	No	45	62.5
Reminded by primary health care center for tetanus vaccination	Yes	57	79.2
	No	15	20.8

Tdap: tetanus–diphtheria–acellular pertussis. Percentages may not total 100% due to rounding.

The primary source of information regarding tetanus and Tdap immunization was family physicians (79%), followed by obstetricians/gynecologists (9%), other health care workers (6%), and family members or friends (6%) (Figure 1). The most frequently reported reasons for delayed or non-receipt of tetanus/Tdap vaccination were waiting for the appropriate gestational week following appointment scheduling by the primary health care center and insufficient knowledge about the vaccine (Figure 2). Among participants who did not receive the Tdap vaccine, lack of knowledge and distrust of the vaccine were the most common reasons (each 37%), followed by financial barriers (26%) (Figure 3).

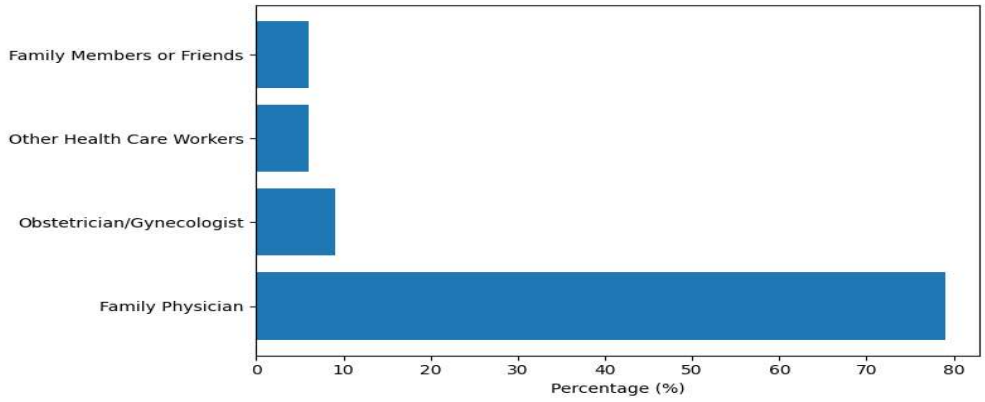

Figure 1. Primary sources of information regarding tetanus and Tdap immunization among pregnant women

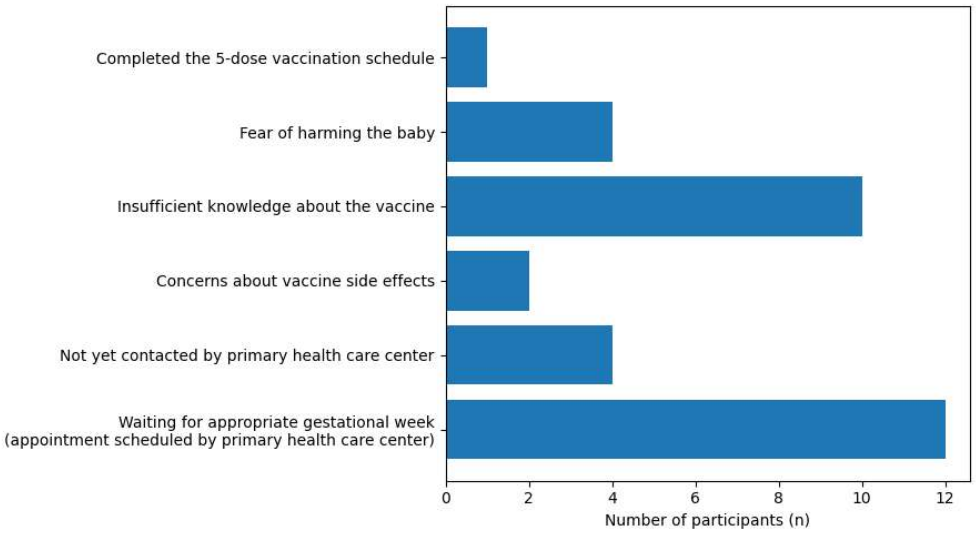

Figure 2. Reasons for delayed or non-receipt of tetanus/Tdap vaccination among pregnant women

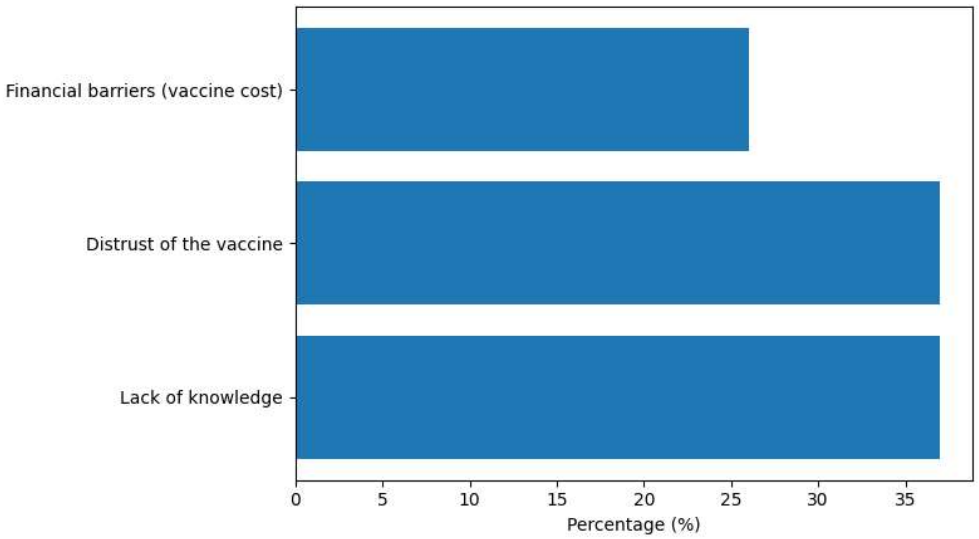

Figure 3. Reasons for not receiving the Tdap vaccine among pregnant women

A statistically significant association was observed between the source of information about vaccines and awareness of the Tdap vaccine (p = 0.022). Participants who reported family physicians as their primary source of information had higher awareness of the Tdap vaccine compared with those who received information from other sources (Table 4).

Table 4. Association between source of information about vaccines and awareness of the Tdap vaccine

Tdap awareness	Family Physician n (%)	Obstetrician/Gynecologist n (%)	Family members or friends n (%)	Other health care workers n (%)	p- value
Yes	8 (66.7)	1 (8.3)	0 (0.0)	3 (25.0)	**0.022**
No	43 (81.1)	5 (9.4)	4 (7.5)	1 (1.9)	

Tdap: tetanus-diphtheria-acellular pertussis. p values were calculated using the chi-square test.

Discussion

This study evaluated tetanus vaccination status, awareness levels, and factors associated with tetanus and Tdap immunization among pregnant women and revealed several important findings. Although awareness of the need for tetanus vaccination during pregnancy was high, actual vaccination coverage during the current pregnancy was considerably lower. In addition, awareness of the Tdap vaccine was limited, and willingness to receive Tdap vaccination was modest. The findings also highlight the critical role of health care providers—particularly family physicians—in shaping vaccine awareness among pregnant women.

In the present study, more than 90% of participants reported being aware of the recommendation for tetanus vaccination during pregnancy; however, only slightly more than half had received tetanus vaccination during the current pregnancy. This discrepancy between awareness and vaccination uptake has been reported in previous studies and suggests that awareness alone may not be sufficient to ensure timely vaccination [6–8]. Factors such as delayed antenatal care visits, scheduling of vaccination appointments according to gestational week, and incomplete follow-up may contribute to this gap, even in settings where tetanus vaccination is provided free of charge through primary health care services [4,5]. At the time of the study, routine maternal Tdap vaccination had not yet been fully integrated into national antenatal immunization practice in Türkiye, which may partially explain the low awareness observed.

Consistent with national guidelines and WHO recommendations, the majority of tetanus vaccinations in this study were administered at family health care centers, emphasizing the central role of primary care in maternal immunization [1,3–5]. Nevertheless, a substantial proportion of women reported delaying vaccination while waiting for the appropriate gestational week, which may partially explain the lower vaccination rates observed. This finding underscores the importance of clear communication regarding vaccination timing and proactive follow-up by primary health care providers.

Awareness of booster doses after childbirth was relatively low, with fewer than half of the participants reporting knowledge of the need for continued tetanus immunization postpartum. This finding aligns with previous reports indicating that maternal immunization counseling often focuses on pregnancy alone, while long-term vaccination schedules receive less attention [6]. Strengthening counseling on the complete tetanus vaccination schedule may help improve long-term protection for women of reproductive age.

One of the most striking findings of this study was the low level of awareness regarding the Tdap vaccine. Only a small proportion of participants were aware of Tdap vaccination, despite strong international recommendations supporting its routine use during pregnancy to prevent pertussis in newborns [9–12]. Similar levels of limited awareness have been reported in other settings, suggesting that Tdap vaccination remains insufficiently integrated into routine antenatal counseling [12,13]. Although Türkiye has made significant progress in tetanus immunization, the relatively low awareness and uptake of Tdap vaccination indicate a need for more explicit communication strategies and guideline dissemination.

Among participants who did not receive the Tdap vaccine, lack of knowledge and distrust toward the vaccine were the most commonly reported reasons, followed by financial concerns. Vaccine hesitancy among pregnant women has been increasingly recognized as a multifactorial phenomenon influenced by trust in health systems, perceived vaccine safety, and provider communication [7,8,14,16–18,19–21,23]. These findings are consistent with previous studies identifying insufficient information, concerns about vaccine safety, and mistrust as major barriers to maternal vaccination [7,8,14]. Even when vaccines are recommended by international authorities such as the WHO, CDC, and ECDC, gaps in communication at the provider–patient level may limit acceptance [9–11].

Importantly, this study demonstrated a statistically significant association between the source of vaccine-related information and awareness of the Tdap vaccine. The association between income level and willingness to receive the Tdap vaccine further suggests that financial considerations may influence maternal vaccine acceptance, particularly in settings where Tdap vaccination is not routinely provided free of charge. Women who reported family physicians as their primary source of information had

significantly higher awareness of Tdap vaccination compared with those relying on other sources. Health care provider recommendation remains one of the strongest predictors of maternal vaccine acceptance, particularly for Tdap vaccination [6,15,20,21,24]. It also highlights the potential impact of strengthening provider-led counseling within primary health care settings.

The findings of this study have several practical implications. First, they suggest that efforts to improve maternal immunization should not only focus on increasing awareness but also address system-level and behavioral barriers that hinder vaccination uptake. Second, integrating structured counseling on Tdap vaccination into routine antenatal visits may help bridge the observed knowledge gap. Finally, empowering family physicians and other primary health care providers with up-to-date guidelines and communication tools may enhance vaccine acceptance and coverage.

This study has some limitations that should be considered. Its cross-sectional design precludes causal inference between awareness, information sources, and vaccination behaviors. The study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. No a priori sample size or power calculation was performed due to the descriptive nature of the study. In addition, data were collected through self-reported questionnaires, which may be subject to recall or social desirability bias. Nevertheless, the study provides valuable insight into maternal tetanus and Tdap vaccination awareness within routine prenatal care and highlights areas for improvement in maternal immunization practices.

In conclusion, despite high awareness of tetanus vaccination during pregnancy, vaccination coverage and awareness of the Tdap vaccine remain suboptimal among pregnant women. Family physicians play a pivotal role in improving vaccine awareness, particularly for Tdap vaccination. Targeted educational interventions and strengthened provider recommendations within primary health care settings may contribute to improved maternal immunization coverage and enhanced protection for both mothers and infants.

Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data supporting the findings of this study are included within the article. Further details are available from the corresponding author upon reasonable request.

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