

# Knowledge and Attitude of Tetanus–Diphtheria Vaccine in a Group of Pregnant Women in Baghdad 2023

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## Abstract

**Background:** Tetanus–diphtheria-containing vaccine is still recommended for pregnant women even in countries that declared the elimination of neonatal tetanus and consequently the maternal tetanus. Many factors may affect vaccination during pregnancy. Knowledge is a key factor that greatly affects pregnant women. **Objective:** The objective of this study was to assess the knowledge and attitude of tetanus–diphtheria vaccine among pregnant women and to find any association between vaccine knowledge and attitude and study variables (age, educational status, employment, family income, socioeconomic status [SES], and antenatal care [ANC]). **Subjects and Methods:** A cross-sectional study was conducted in Baghdad city. Data collection was from March 1, 2023, to May 30, 2023. Thirteen primary health-care centers and two teaching hospitals were chosen conveniently to be included in the study. Total number of participants were 329 primigravida pregnant women. An interview questionnaire was used to collect quantitative data related to the knowledge and attitude of women about tetanus–diphtheria immunization and tetanus infection. **Results:** the study found that 73.6% of women had an accepted level of knowledge, 11.8% had an optimal level of knowledge, while 14.5% had a poor level of knowledge. Higher knowledge and attitude levels were significantly higher among older age group women and those with higher level of education and SES. ANC attendance and work status showed statistical insignificance regarding the level of knowledge and attitude. Women identify ANC and family members and friends as their primary sources of information about tetanus infection and immunization. **Conclusions:** Women’s knowledge was acceptable regarding tetanus infection and tetanus–diphtheria immunization. It is possible for proper health education targeting young women to prevent the occurrence of maternal neonatal tetanus. This might be possible with proper use of mass media to increase awareness.

**Keywords:** Attitude, diphtheria, immunization, knowledge, tetanus

## INTRODUCTION

Maternal immunization has emerged as a strategy to reduce the morbidity and mortality of pregnant women and their very young infants during the vulnerable 1<sup>st</sup> week of the infant’s life by transfer of maternally derived pathogen-specific antibodies through the placenta and breast milk. Tetanus-containing vaccine is still recommended for pregnant women even in countries that declared the elimination of neonatal tetanus and consequently the maternal tetanus. The Sustainable Development Goals, launched in 2015, set the target 3.2 to end preventable deaths of newborns and children under 5 years of age by 2030 and to reduce neonatal mortality to a maximum of 12 per 1000 live births.<sup>[1,2]</sup>

### Tetanus

Tetanus is a life-threatening disease that can be prevented by vaccines containing tetanus toxoids. Antibodies produced

by maternal immunization that pass to the fetus through the placenta protect the baby in terms of tetanus during the neonatal period.<sup>[3,4]</sup> Tetanus during pregnancy or within 6 weeks of the end of pregnancy is called “maternal tetanus,” and tetanus within the first 28 days of life is called “neonatal tetanus.”<sup>[5]</sup>

The World Health Organization (WHO) definition of a confirmed neonatal tetanus case is an illness occurring in an infant who has the normal ability to suck and cry in the first 2 days of life but who loses this ability between days 3 and 28 of

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life and becomes rigid or has spasms. Neonatal tetanus occurs when nonsterile instruments are used to cut the umbilical cord or when contaminated material is used to cover the umbilical stump. Deliveries carried out by people with unclean hands or on a contaminated surface are also risk factors. Tetanus is diagnosed on the basis of clinical features and does not require laboratory confirmation.<sup>[6]</sup>

## Diphtheria

Diphtheria is a highly contagious and potentially life-threatening bacterial disease caused by *Corynebacterium diphtheriae*.<sup>[7]</sup> Although diphtheria was reduced from a major cause of childhood death to a medical rarity in the Western hemisphere in the early 20<sup>th</sup> century, recurring reminders of the fragility of this success, particularly in conflict areas, emphasize the need to continue vigorous promotion of those same control principles across the global community.<sup>[8]</sup> Death occurs in approximately 5%–10% of all respiratory cases, with higher death rates (of up to 20%) among persons younger than 5 and older than 40 years of age. Complications of myocarditis account for most diphtheria-related deaths.<sup>[8,9]</sup>

The single most effective control measure is maintaining the highest possible level of immunization in the community. Other methods of control include prompt treatment of cases and a community surveillance program.<sup>[6]</sup>

## World Health Organization recommendations

The WHO recommended combination vaccines including Tetanus–diphtheria vaccine (Td) for immunization against tetanus in pregnant women. The first dose is recommended at the first prenatal visit, and the second dose is recommended 4 weeks following that for pregnant women whose vaccination status is unknown or those who have not previously been vaccinated. Vaccine doses should be completed at least 2 weeks before delivery to ensure adequate protection after the second dose of the vaccine. At least 6 months after the second dose, the third dose should be completed. Then, the fourth dose should be administered after 1 year from the third dose and finally the fifth dose administered after 1-year interval.<sup>[9]</sup> Elimination of maternal and neonatal tetanus (MNT) has been defined as <1 neonatal tetanus (NT) case per 1000 live births in a specific region by the WHO. MNT elimination strategies include vaccination and hygienic practices at delivery.<sup>[4,10]</sup>

Tetanus–diphtheria vaccine (Td) is currently the most effective intervention to prevent MNT disease and neonatal mortality.<sup>[3]</sup>

Epidemiology of tetanus and diphtheria in Iraq according to the latest annual statistical reports by the Ministry of Health showed that zero case of neonatal tetanus has been recorded for the years 2020, 2021, and 2022.<sup>[11]</sup>

## SUBJECTS AND METHODS

### Study design and duration

A cross-sectional study with an analytic element was conducted. Two districts and one teaching hospital were chosen conveniently from each health directorate. 3–4 primary

health-care centers (PHCCs) were chosen from each district to conduct the study. A total of 13 PHCCs and two teaching hospitals in Baghdad Al-Karkh and Al-Rusafah directorates were included in the study. Data collection took place during the period from March 1, 2023, to May 30, 2023. The targeted population was prime pregnant women attending antenatal care (ANC) in selected PHCCs and hospitals, and who accept to participate in the study. Data were collected by direct interview using a structured questionnaire adapted from previous studies with modifications.<sup>[12,13]</sup>

### Pilot study

A preliminary study was conducted on 20 pregnant women who were not included in the final study group. The questionnaire was pretested to evaluate the response of participants in means of time, and any difficulties in understanding questions.

### Scoring system

Blooms cutoff points were used to categorize knowledge levels was assessed by giving answers of yes 1, no 0, I do not know 0 score, where 80%–100% correct responses, mean good knowledge, 60%–79% correct responses, mean moderate knowledge, and <60% correct responses mean poor knowledge.<sup>[14]</sup> Attitude was assessed by putting 10 statements on the Likert scale; the statement on the Likert scale had positive and negative responses that ranged from strongly agree 5, agree 4, neither agree nor disagree 3, disagree 2, and strongly disagree 1.<sup>[15]</sup>

The maximum score for attitude expected from all statements is 50 and the minimum of 10. If the persons score above or equal to 30 will be considered a positive attitude and if the score <30 considered as negative attitude toward Td vaccine in pregnancy.<sup>[16]</sup>

## RESULTS

A total of 329 participants enrolled in the study. About 296 of them only finished the questionnaire, with a response rate of 90%. The most frequent age group was 25–29 years, with a total of 31.6%. Moreover, the least frequent age group was ≥40 years, with a total of 0.6%. Regarding education, 42.2% of the study group had college and higher education degree and 42.9% of them were in their third trimester. 69.9% of them were unemployed, and 76.3% of the study group were middle income. Regarding residency, 90.9% of them lived in urban. ANC visits (81.5%) were adequate as shown in Table 1.<sup>[17]</sup>

Table 2 shows that 93% of study participants knew that there is a vaccine in pregnancy, and 90% of them heard about Td vaccine. Regarding the source of information, 52% attributed to ANC. 52.7% of them knew that the vaccine was used for protection of the mother and baby while 46.3% did not know disease prevented by vaccine. 93.9% of them think vaccine safe to be taken in pregnancy and 42.6% of them did not know the seriousness of tetanus infection of newborns. 51.4% did not think that vaccine can cause abortions, 87.2% knew where to find vaccine, and 68.9% knew when to take vaccine.

### Those who answered yes in the first two questions continued

The age group (25–29) showed a statistically significant influence on knowledge level about vaccine in pregnancy ( $P = 0.0001$ ). Regarding education, college graduates had the best knowledge about vaccine with a  $P$  (0.001). The urban residence had statistical significance  $P = 0.0001$ . Family income had a statistically significant  $P = 0.025$ . Socioeconomic status (SES) was statistically significant with a  $P = 0.0001$ . Pregnancy duration, work, and ANC status showed no association [Table 3].

The age group (25–29) showed a statistically significant influence on knowledge about Td vaccine in pregnancy ( $P = 0.0001$ ), as 33.1% compared to 48.5% of those who did not know about Td vaccine in the age group <20 years. Regarding education college and higher education graduates had the

**Table 1: Distribution of the study group according to sociodemographic characteristics ( $n=329$ )**

Demographic characteristics	<i>n</i> (%)
Age (years)	
<20	59 (17.9)
20–24	88 (26.7)
25–29	104 (31.6)
30–34	53 (16.1)
35–39	23 (7.0)
>40	2 (0.6)
Education	
Illiterate	12 (3.6)
Read and write	25 (7.6)
Primary	73 (22.2)
Secondary	80 (24.3)
College and higher education	139 (42.2)
Pregnancy duration	
1 <sup>st</sup> trimester	48 (14.6)
2 <sup>nd</sup> trimester	140 (42.6)
3 <sup>rd</sup> trimester	141 (42.9)
Work	
Unemployed	230 (69.9)
Employed	99 (30.1)
Residence	
Rural	30 (9.1)
Urban	299 (90.9)
Family income	
Low	58 (17.6)
Middle	251 (76.3)
High	20 (6.1)
Socioeconomic status	
Low	69 (21.0)
Middle	126 (38.3)
High	134 (40.7)
ANC visits	
Irregular	61 (18.5)
Adequate and regular	268 (81.5)

ANC: Antenatal care

best knowledge about vaccine with a  $P = 0.0001$ . Pregnancy duration had no statistically significant association. Work status showed statistical significance  $P = 0.049$ . Residence in urban had a statistical significance of 0.0001. Family income was statistically significant  $P = 0.002$ . SES had statistically significant  $P = 0.0002$ . ANC shows statistical significance  $P = 0.021$  [Table 4].

Regarding attitude toward Td vaccine [Table 5], 53% of the study samples disagreed that tetanus–diphtheria diseases are rare and no longer exist. 69.2% of them disagreed with the thinking it is better to get infected than immunized. 81.4%

**Table 2: Knowledge about tetanus–diphtheria vaccine among study participants**

Knowledge about TD vaccine	<i>n</i> (%)
Do you know there is vaccine for pregnant women	
Yes	309 (93.9)
No	20 (6.1)
Did you heard about TD vaccine in pregnancy	
Yes	296 (90.0)
No	33 (10.0)
Source of information ( $n=296$ )	
PHC-ANC	154 (52.0)
TV and internet	7 (2.4)
Family and friends	112 (37.8)
Others	23 (7.8)
Vaccine used for	
DNK	121 (40.9)
Treat TD	19 (6.4)
Protect from TD	156 (52.7)
Disease conditions prevented by vaccine	
DNK	137 (46.3)
DT infection in infants	24 (8.1)
DT infection in pregnant	43 (14.5)
DT infection in infants and pregnant	92 (31.1)
Do you think vaccine safe for pregnant women	
No	18 (6.1)
Yes	278 (93.9)
Do you know the seriousness of tetanus infection of newborn	
DNK	126 (42.6)
Low	17 (5.7)
Middle	67 (22.6)
High	86 (29.1)
Do you think vaccine can cause abortions	
DNK	105 (35.5)
No	152 (51.4)
Yes	39 (13.2)
Do you know where to find vaccine	
No	38 (12.8)
Yes	258 (87.2)
Do you know when to take vaccine	
No	92 (31.1)
Yes	204 (68.9)

DNK: Do not know, PHC-ANC: Primary health care-antenatal care, TD: Tetanus–diphtheria, DT: Diphtheria and tetanus

think that vaccine protects newborns. 74.7% think that tetanus and diphtheria are real threats to newborns. 81.8% think vaccine effective at protecting newborns. 80.7% think that it is safe to vaccinate during pregnancy. 61.8% think that it is better to avoid vaccination during pregnancy. 65.9% disagreed that vaccination during pregnancy can cause abortions and congenital anomalies. 84.8% think that it is better to vaccinate during pregnancy instead of tetanus risk, and 87% of study participants will recommend vaccine to others.

Distribution of attitude score results showed that majority of study participants 218 (73.6%) had moderate attitude scores whereas only 35 (11.8%) had good scores as shown in [Table 6].

**Table 3: Distribution of demographic characteristics according to knowledge of vaccine during pregnancy (n=329)**

Associations	Know there is vaccine for pregnant women		P
	No, n (%)	Yes, n (%)	
Age (years)			
<20	12 (60.0)	47 (15.2)	0.0001*
20–24	4 (20.0)	84 (27.2)	
25–29	3 (15.0)	101 (32.7)	
30–34	1 (5.0)	52 (16.8)	
>35	-	25 (8.1)	
Education			
Illiterate	2 (10.0)	10 (3.2)	0.001*
Read and write	5 (25.0)	20 (6.5)	
Primary	8 (40.0)	65 (21.0)	
Secondary	3 (15.0)	77 (24.9)	
College and higher education	2 (10.0)	137 (44.3)	
Pregnancy duration			
1 <sup>st</sup> trimester	5 (25.0)	43 (13.9)	0.088
2 <sup>nd</sup> trimester	4 (20.0)	136 (44.0)	
3 <sup>rd</sup> trimester	11 (55.0)	130 (42.1)	
Work			
Unemployed	17 (85.0)	213 (68.9)	0.129
Employed	3 (15.0)	96 (31.1)	
Residence			
Rural	8 (40.0)	22 (7.1)	0.0001*
Urban	12 (60.0)	287 (92.9)	
Family income			
Low	8 (40.0)	50 (16.2)	0.025*
Middle	11 (55.0)	240 (77.7)	
High income	1 (5.0)	19 (6.1)	
Socioeconomic status			
Low	11 (55.0)	58 (18.8)	0.0001*
Middle	7 (35.0)	119 (38.5)	
High	2 (10.0)	132 (42.7)	
ANC			
Irregular	7 (35.0)	54 (17.5)	0.051
Regular	13 (65.0)	255 (82.5)	

\*Significant difference between percentages using Pearson Chi-square test at 0.05 level. ANC: Antenatal care

Demographic characteristics showed no statistically significance association in relation to to attitude scores [Table 7].

Knowledge about Td vaccine in relation to attitude scores shows statistical significance  $P = 0.0001$  in means of vaccine utilization of protection from Td, with 51.8% of them within neutral attitude scores. Also there was a significant association in relation to diseases prevented by vaccine. with thinking that vaccine is safe for pregnant women, and with seriousness of tetanus infection of newborn ( $P = 0.022, P = 0.0001, P = 0.001$ ) respectively, [Table 8].

## DISCUSSION

Knowledge and attitude is an influence that significantly affects

**Table 4: Distribution of demographic characteristics according to the knowledge of tetanus–diphtheria vaccine (n=329)**

Associations	Heard about TD vaccine		P
	No, n (%)	Yes, n (%)	
Age (years)			
<20	16 (48.5)	43 (14.5)	0.0001*
20–24	7 (21.2)	81 (27.4)	
25–29	6 (18.2)	98 (33.1)	
30–34	3 (9.1)	50 (16.9)	
>35	1 (3.0)	24 (8.1)	
Education			
Illiterate	5 (15.2)	7 (2.4)	0.0001*
Read and write	6 (18.2)	19 (6.4)	
Primary	10 (30.3)	63 (21.3)	
Secondary	6 (18.2)	74 (25.0)	
College and higher education	6 (18.2)	133 (44.9)	
Pregnancy duration			
1 <sup>st</sup> trimester	6 (18.2)	42 (14.2)	0.079
2 <sup>nd</sup> trimester	8 (24.2)	132 (44.6)	
3 <sup>rd</sup> trimester	19 (57.6)	122 (41.2)	
Work			
Unemployed	28 (84.8)	202 (68.2)	0.049*
Employed	5 (15.2)	94 (31.8)	
Residence			
Rural	10 (30.3)	20 (6.8)	0.0001*
Urban	23 (69.7)	276 (93.2)	
Family income			
Low	13 (39.4)	45 (15.2)	0.002*
Middle	18 (54.5)	233 (78.7)	
High income	2 (6.1)	18 (6.1)	
Socioeconomic status			
Low	13 (39.4)	45 (15.2)	0.002*
Middle	18 (54.5)	233 (78.7)	
High	2 (6.1)	18 (6.1)	
ANC			
Irregular	11 (33.3)	50 (16.9)	0.021*
Regular	22 (66.7)	246 (83.1)	

\*Significant difference between percentages using Pearson Chi-square test at 0.05 level. ANC: Antenatal care, TD: Tetanus–diphtheria

**Table 5: Attitude toward tetanus–diphtheria vaccine according to 5 statements on the Likert scale**

Attitude toward TD vaccine during pregnancy (n=296)	Strongly disagree, n (%)	Disagreed, n (%)	Neutral, n (%)	Agree, n (%)	Strongly agree, n (%)
Do you think TD diseases are rare no longer exist*	28 (9.5)	128 (43.2)	104 (35.1)	33 (11.1)	3 (1.0)
Do you think better get infected than immunized*	43 (14.5)	162 (54.7)	72 (24.3)	12 (4.1)	7 (2.4)
Do you think vaccine protect newborns	2 (0.7)	14 (4.7)	39 (13.2)	186 (62.8)	55 (18.6)
Do you think TD diseases are real threat for newborns	-	22 (7.4)	53 (17.9)	179 (60.5)	42 (14.2)
Do you think vaccine effective at protecting newborns	-	2 (0.7)	52 (17.6)	189 (63.9)	53 (17.9)
Do you think it is safe to be vaccinated during pregnancy	-	6 (2.0)	51 (17.2)	178 (60.1)	61 (20.6)
Do you think it is better to avoid vaccinations during pregnancy*	21 (7.1)	162 (54.7)	79 (26.7)	28 (9.5)	6 (2.0)
Do you think vaccinations during pregnancy can cause abortions and congenital anomalies*	27 (9.1)	168 (56.8)	81 (27.4)	15 (5.1)	5 (1.7)
Do you think it is better to vaccinate during pregnancy instead of tetanus risk	2 (0.7)	5 (1.7)	38 (12.8)	189 (63.9)	62 (20.9)
Will you advise others with vaccine	1 (0.3)	1 (0.3)	35 (11.8)	169 (57.1)	90 (30.4)

\*Questions with negative responses. TD: Tetanus–diphtheria

**Table 6: Distribution of attitude score results**

Attitude score	n (%)
Good: 32–40 (80%–100%)	35 (11.8)
Moderate: 24–31 (60%–79%)	218 (73.6)
Poor: <24 (<60%)	43 (14.5)

pregnant women to obtain tetanus vaccination during pregnancy. Results from this study demonstrated that pregnant women's knowledge and attitude were good in some items and poor in other items, with a total attitude score of 73.6%. The results were similar to a previous study from Iraq<sup>[18]</sup> and Uganda.<sup>[19]</sup> The same findings were found in other studies done previously in Iraq<sup>[20,21]</sup> and Nigeria<sup>[22,23]</sup> which showed adequate knowledge of mothers about tetanus immunization. The finding of the study, however, contradicts the findings of studies conducted in Egypt<sup>[24,25]</sup> and Saudi Arabia,<sup>[26]</sup> which showed that most of the women had poor knowledge about MNT and tetanus-containing vaccines. The dissimilarities in results may be due to variances in study designs, sample size, tools used, and variation in the studied population characteristics.<sup>[18]</sup> The findings from the aforementioned studies might point out that most countries including Iraq could not reach the WHO Global Immunization target of at least 90% of national tetanus vaccination coverage and at least 80% of tetanus vaccination coverage in every district.<sup>[27]</sup> Mothers' knowledge and attitude regarding immunization can potentially affect vaccination uptake. Mistaken belief of Td vaccination by pregnant women leads to low vaccination coverage.<sup>[28]</sup>

### Age

The study revealed that there was a significant association between pregnant women's age and knowledge of vaccine since most of those did not hear of Td vaccine were younger than 20 years old. This might be due to the fact that most of the young age mothers had early marriages and dropped out of schools therefore did not get the chance for proper education.

### Education

Women having higher education were more likely to have good vaccine knowledge and attitude in comparison to those

with primary education. The results were in agreement with findings reached by studies from Nigeria,<sup>[29]</sup> Pakistan,<sup>[30]</sup> and Egypt.<sup>[31]</sup> A possible explanation may be that educated mothers generally have greater knowledge and attitude regarding the benefits and consequences of vaccine nonintake, increasing the likelihood of receiving ANC and Td vaccination. Also vaccine campaigns target schools plays an important health education tool among females at reproductive age groups. Education enhances women's utilization of health services in general, in consistence with studies from Nigeria<sup>[32]</sup> and Ivory Coast.<sup>[33]</sup>

### Working status

The result of the current study did not show a significant relationship between working status of the mother and vaccine knowledge which is in agreement with finding from studies conducted in Sudan<sup>[34]</sup> and Afghanistan.<sup>[35]</sup> This might be attributed to low work opportunities.

### Antenatal care

Previous studies revealed that having ANC follow-up during pregnancy would help mothers' uptake of tetanus vaccine, such as studies from Riyadh<sup>[31]</sup> and Nigeria.<sup>[29]</sup> While the finding of the present study showed that ANC attendance had no significant influence on Td vaccination uptake. This might be attributed to attending a private clinic for care. It seems that obstetricians themselves have wrong concepts in that as long as delivery takes place in an equipped and clean hospital, there is no need for tetanus vaccination. This may explain the current study result. In fact, this argument would only be useable in circumstances where all deliveries are performed under optimum conditions and when effective tetanus immunization programs and good postexposure prophylaxis after pregnancy are offered, which is almost not the case in most developing countries.<sup>[18]</sup>

### Socioeconomic status

Knowledge and attitude were found to be affected by women's socioeconomic level, education level, residence, health education about the importance of Td vaccine, knowledge of

**Table 7: Attitude scores in relation to sociodemographic characteristics**

Demographic characteristics	Attitude score			P
	Positive: 32–40 (80%–100%), n (%)	Neutral: 24–31 (60%–79%), n (%)	Negative: <24 (<60%), n (%)	
Age (years)				
<20	3 (8.6)	32 (14.7)	8 (18.6)	0.120
2–24	11 (31.4)	54 (24.8)	16 (37.2)	
25–29	12 (34.3)	75 (34.4)	11 (25.6)	
30–34	3 (8.6)	43 (19.7)	4 (9.3)	
>35	6 (17.1)	14 (6.4)	4 (9.3)	
Education				
Illiterate	-	4 (1.8)	3 (7.0)	0.201
Read and write	1 (2.9)	14 (6.4)	4 (9.3)	
Primary	8 (22.9)	43 (19.7)	12 (27.9)	
Secondary	6 (17.1)	56 (25.7)	12 (27.9)	
College and higher education	20 (57.1)	101 (46.3)	12 (27.9)	
Pregnancy duration				
1 <sup>st</sup> trimester	4 (11.4)	30 (13.8)	8 (18.6)	0.244
2 <sup>nd</sup> trimester	21 (60.0)	91 (41.7)	20 (46.5)	
3 <sup>rd</sup> trimester	10 (28.6)	97 (44.5)	15 (34.9)	
Work				
Unemployed	20 (57.1)	147 (67.4)	35 (81.4)	0.064
Employed	15 (42.9)	71 (32.6)	8 (18.6)	
Residence				
Rural	1 (2.9)	14 (6.4)	5 (11.6)	0.286
Urban	34 (97.1)	204 (93.6)	38 (88.4)	
Family income				
Low	3 (8.6)	33 (15.1)	9 (20.9)	0.488
Middle	29 (82.9)	171 (78.4)	33 (76.7)	
High income	3 (8.6)	14 (6.4)	1 (2.3)	
Socioeconomic status				
Low	3 (8.6)	38 (17.4)	11 (25.6)	0.055
Middle	12 (34.3)	83 (38.1)	21 (48.8)	
High	20 (57.1)	97 (44.5)	11 (25.6)	
ANC				
Irregular	4 (11.4)	37 (17.0)	9 (20.9)	0.537
Regular	31 (88.6)	181 (83.0)	34 (79.1)	

ANC: Antenatal care

mothers about NT disease, and Td vaccine. Similar results were found in a study from Egypt.<sup>[31]</sup>

## CONCLUSIONS

The study has shown that tetanus–diphtheria vaccine knowledge and attitude among pregnant women in Baghdad were acceptable, yet there is a place to increase uptake. Factors identified to be associated with Td vaccine knowledge were age of the women, education, and SES. The study found that 73.6% of women had an acceptable level of knowledge, 11.8% had an optimal level of knowledge, while 14.5% had a poor level of knowledge. There were substantial missed opportunities for Td immunization within the same group of mothers who attended private gynecological outpatients. Health-care providers in different health sectors need to fill this gap by establishing two-way connection with obstetric

and gynecologic departments to strengthen the importance of vaccine and immunization coverage.

## Recommendations

Regular ANC is an important way to expand Td vaccination. Targeting women at productive age in educational program about tetanus vaccination, and conducting Td vaccination campaign frequently, this better to be done in the secondary schools of girls, institutes, and colleges. Public knowledge and attitude about the importance of vaccination should be enhanced using different types of mass media and religious and community leaders.

## Ethical consideration

A clearance for the study was obtained from the Iraqi Board for Medical Specialization. An official letter of permission was acquired from both Baghdad Al-Karkh and Al-Rusafah Health Directorates addressed to each selected district and

**Table 8: Attitude scores in relation to knowledge about tetanus–diphtheria vaccine**

Knowledge about TD vaccine	Attitude score			P
	Positive 32–40 (80%–100%), n (%)	Neutral 24–31 (60%–79%), n (%)	Negative <24 (<60%), n (%)	
Source of information (n=296)				
PHC-ANC	16 (45.7)	118 (54.1)	20 (46.5)	0.292
TV and internet	-	6 (2.8)	1 (2.3)	
Family and friends	16 (45.7)	81 (37.2)	15 (34.9)	
Others	3 (8.6)	13 (6.0)	7 (16.3)	
Vaccine used for				
DNK	4 (11.4)	90 (41.3)	27 (62.8)	0.0001*
Treat TD	1 (2.9)	15 (6.9)	3 (7.0)	
Protect from TD	30 (85.7)	113 (51.8)	13 (30.2)	
Disease conditions prevented by vaccine				
DNK	11 (31.4)	98 (45.0)	28 (65.1)	0.022*
TD infection in infants	3 (8.6)	18 (8.3)	3 (7.0)	
TD infection in pregnant	3 (8.6)	37 (17.0)	3 (7.0)	
TD infection in both	18 (51.4)	65 (29.8)	9 (20.9)	
Do you think vaccine is safe for pregnant women				
No	-	9 (4.1)	9 (20.9)	0.0001*
Yes	35 (100)	209 (95.9)	34 (79.1)	
Do you know the seriousness of tetanus infection of newborn				
DNK	11 (31.4)	86 (39.4)	29 (67.4)	0.001*
Low	-	13 (6.0)	4 (9.3)	
Middle	8 (22.9)	56 (25.7)	3 (7.0)	
High	16 (45.7)	63 (28.9)	7 (16.3)	
Do you think vaccine can cause abortions				
DNK	8 (22.9)	79 (36.2)	18 (41.9)	0.075
No	20 (57.1)	116 (53.2)	16 (37.2)	
Yes	7 (20.0)	23 (10.6)	9 (20.9)	
Do you know where to find vaccine				
No	1 (2.9)	29 (13.3)	8 (18.6)	0.109
Yes	34 (97.1)	189 (86.7)	35 (81.4)	
Do you know when to take vaccine				
No	8 (22.9)	72 (33.0)	12 (27.9)	0.429
Yes	27 (77.1)	146 (67.0)	31 (72.1)	

\*Significant difference between percentages using Pearson Chi-square test at 0.05 level. DNK: Do not know, PHC-ANC: Primary health care-antenatal care, TD: Tetanus–diphtheria, DT: Diphtheria and tetanus

hospital. Oral informed consent was acquired from each interviewed mother.

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There are no conflicts of interest.

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