



Knowledge and uptake of tetanus toxoid vaccine among mothers in a semi-urban community in South-South Nigeria.

Innocent Osi Alenoghena¹, Charles Omheaka Okpere², Irene Irenosen Akhiden³, Adunbiola Patrick⁴

¹Department of Community Health, Faculty of Clinical Sciences, Ambrose Alli University, Ekpoma, Edo State, Nigeria.

²Unified Local Government Service of Edo State, Nigeria

³Department of Anaesthesiology-Surgery, Ambrose Alli University, Ekpoma, Edo State.

⁴Department of Medicine, Ambrose Alli University, Ekpoma, Edo State, Nigeria

Abstract

Background: Tetanus is a vaccine-preventable acute disease that is caused by *Clostridium tetani*, and it has remained a major cause of morbidity and mortality in children under the age of 5 years in developing countries. This study aimed to evaluate the level of knowledge and uptake of tetanus toxoid (TT) vaccine among mothers in Esan Central L.G.A.

Materials and Methods: This community-based cross-sectional study was conducted in the Esan Central Local Government Area of Edo State. Data were collected from 226 pregnant women attending antenatal clinics, using an interviewer-administered questionnaire. Ethical approval was obtained from the Research and Ethics Committee of Irrua Specialist Teaching Hospital, Irrua. Analysis was conducted in IBM SPSS version 21, and results were presented as frequencies and proportions in tables and charts.

Results: All the respondents were aware of tetanus, and 203 (90%) were aware of tetanus toxoid vaccines. 88 (38.9%) of the respondents had good knowledge of tetanus toxoid immunization, 95 (42.0%) had fair knowledge, and 43 (19.0%) had poor knowledge. Knowledge of tetanus toxoid was significantly associated with maternal age ($p=0.0001$), educational status ($p=0.001$), and occupation ($p=0.001$), with older and more educated women having better knowledge. One hundred and ninety-nine (88.1%) respondents had a positive perception towards TT immunization. Respondents' perceptions were significantly associated with educational status ($p=0.027$) and occupation ($p=0.001$). One hundred and twenty-five (55.3%) had taken TT vaccine. Vaccine uptake was significantly associated with educational status ($p=0.001$) and occupation ($p=0.001$).

Conclusion: Respondents' educational status and occupation were significantly associated with knowledge of TT, perceptions of the vaccine, and vaccine uptake. Common hindrances to vaccine uptake included negative attitudes among some health workers, poor service quality, cancellations of scheduled services, and perceived vaccine side effects. Health workers should receive training and retraining, and health education should continue at all levels of health care. This should also be carried out in schools at all levels in the State.

Keywords: Knowledge, Uptake, tetanus toxoid vaccine, pregnant women, South-South Nigeria

Corresponding Author:

Innocent Osi Alenoghena

Department of Community Health, Faculty of Clinical Sciences,
Ambrose Alli University, Ekpoma, Edo State, Nigeria.

alendoc@yahoo.com

DOI: 10.61386/imj.v19i4.1363

Introduction

Tetanus is a vaccine-preventable acute disease that is caused by a highly potent neurotoxin produced by the spore-forming bacterium *Clostridium tetani*, which thrives in anaerobic environments.¹ *C. tetani* spores are present in soil and the wider environment throughout the world.² Although the disease is

known to affect all age groups, it is more prevalent and severe among neonates and pregnant women, who have not been sufficiently immunized with tetanus toxoid-containing vaccines and those in areas of poor hygiene.³ Tetanus has remained a major cause of morbidity and mortality in children under the age of 5 years in developing countries, including sub-Saharan Africa (SSA).^{4,5}

It has been documented that in 2008, there were up to 180,000 deaths attributable to maternal and neonatal tetanus.⁶ Also, maternal tetanus has been reported to account for about 30,000 maternal deaths (approximately about 5% of all maternal deaths) each year.⁷ Globally, there were about 56,743 neonatal deaths in 2015, with sub-Saharan Africa and Southeast Asia accounting for 89% of these deaths.⁸ Moreover, it has been reported that Nigeria contributes up to two-thirds of the global burden of neonatal tetanus. World Health Organization (WHO) records showed that 10.6 million children die before the age of 5 annually and that an estimated 1.4 million are due to Tetanus and other vaccine-preventable diseases.² Prevention of tetanus is basically through vaccination with tetanus toxoid (TT), which is unquestionably one of the most cost-effective interventions in the health system and has enormous benefits for health and well-being. Thus, maintaining a high level of immunization coverage is important in the control and elimination of many cases of the disease.²

Tetanus is characterized by muscle rigidity and painful muscle spasms caused by the tetanus toxin's blockade of inhibitory neurons that normally oppose and modulate the action of excitatory motor neurons.⁹ If the mother is not immunized with the correct number of doses of tetanus toxoid (TT) vaccine, neither she nor her newborn infant is protected against tetanus at delivery.¹ The WHO estimates that only 5% of neonatal tetanus (NT) cases are reported, even from countries with well-developed surveillance systems. Since 1989, when the World Health Assembly called for the elimination of NT, 110 out of 161 developing countries are thought to have achieved elimination (as of the end of 2004).¹⁰ The UNICEF, WHO, and UNFPA agreed in 1999 to set the year 2005 as the target date for worldwide elimination, defined as the reduction of NT cases to <1/1000 live births in every district of every country, and this definition is also being used as a proxy for the elimination of maternal tetanus.²

The purpose of giving the vaccine to women of childbearing age and to pregnant women is to protect them from tetanus and to protect their newborn infants against NT11. Tetanus vaccine is safe to give during pregnancy and produces protective antibody levels in >80% of recipients after 2 doses 1, which provide protection for 1–3 years, although some studies have reported even longer protection². Because tetanus spores are ubiquitous in the environment, eradication is not biologically feasible; however, high immunization coverage among pregnant women, clean delivery practices, and the identification and implementation of corrective actions in high-risk areas are the three primary strategies for elimination. Antenatal services provide a convenient opportunity for vaccinating pregnant women.¹² And where antenatal care coverage is inadequate, mass immunization of women of childbearing age could be an alternative option.¹³

Maternal and neonatal tetanus (MNT) is still a major public health problem in about 25 countries, mainly in Africa and Asia.² According to the WHO, Nigeria is one of 30 remaining high-risk countries that have not yet achieved MNT elimination. Available data indicate that 18 states (out of 37) are at risk for MNT, and many hospital-based studies have identified NT as a problem of high magnitude in Nigeria.¹⁴ MNT elimination is an initiative aimed at reducing cases to such low levels that the disease no longer constitutes a major public health problem. Unlike polio and smallpox, tetanus cannot be eradicated because tetanus spores are constantly present in the environment worldwide.¹⁵ However, this can be reduced to manageable levels and eliminated through immunization of pregnant women and other women of reproductive age and promotion of more hygienic deliveries and cord care practices.² Mothers and newborns contract tetanus when deliveries happen in unhygienic conditions, as can be the case in remote and underdeveloped areas.² Risk factors for NT incidence relate to prenatal, perinatal and neonatal factors, and include lack of antenatal care for the pregnant woman, including lack of her immunization with Tetanus Toxoid (TT), and unhygienic delivery and cord care, limited access to health services, poor hygienic conditions, lack of access to sterilized childbirth delivery tools and unhygienic practices during childbirth.²

Evidence shows that a range of determinants affect the utilization of TT immunization. For instance,

women's education and their wealth index can impose variations in immunization coverage.¹ Mothers' immunization status also differs from urban to rural areas, as well as from one part of the country to another.¹⁶ Furthermore, studies indicate that maternal age, marital and occupational status, distance from health facilities, number of visits to healthcare facilities, and the number of children in the house can also considerably determine TT immunization usage.¹⁷ The present study aimed to evaluate the level of knowledge and uptake of tetanus toxoid immunization among mothers in Esan Central L.G.A.

Methodology

Study Area

Esan Central Local Government Area is a Local Government Area of Edo State, Nigeria. Its administrative headquarters is in Irrua. The area is located within the latitudes 8° 35'E and 8° 30'N, and the longitudes 8° 21'E and 8° 35'E (2006 census). The area comprises the following towns and villages: Irrua, Ewu, Opoji, Ugbegun, Igueben, Ebelle, and Ewossa.

A descriptive cross-sectional study was employed, and the study lasted for a period of 6 months from April to October 2019.

The study participants were pregnant women attending antenatal clinics in Esan Central Local Government Area of Edo State. Those included were pregnant women attending antenatal clinics and those present at the health facilities on the day of data collection. Those excluded were pregnant women; mothers who were not present on the day the questionnaire was administered and those who declined participation.

Sample size was estimated using the Cochran formula¹⁸ for cross-sectional surveys

$$\text{Sample size } n = Z^2 Pq / d^2$$

n = Sample size

Z = Standard normal deviation, set at 1.96 to correspond to 95% confidence interval.

P = Prevalence of tetanus was the percentage of women whose most recent live birth was not protected against neonatal tetanus in Edo State, which was 17.9%, as documented in the Nigeria Demographic and Health Survey 2018 key indicators report of the National Population Commission, Abuja, Nigeria.

$q = 1 - P$

d = Error margin allowed from the study, which is a measure of the level of accuracy.

Therefore, for this study $Z = 1.96$, $P = 17.9\%$ (i.e. 0.179) and $d = 0.05$

From the formula above

$$\text{Sample size} = Z^2 Pq / d^2$$

$$\text{or } n = Z^2 P(1-P) / d^2$$

$$n = (1.96)^2 \times 0.179 \times (1 - 0.179) / (0.05)^2$$

$$n = 3.8416 \times 0.179 \times 0.821 / 0.0025 = 0.5645576944 / 0.0025$$

$$n = 225.82, \text{ approximately } 226$$

From the calculation above, the estimated sample size was 226.

Attrition or non-response rate = 10% of the sample size

$$226 \times 10/100 = 22.6 = 23$$

10% of the sample size was then added to account for potential nonresponse during the study. Therefore, the estimated sample size was $226 + (10\% \text{ of } 226) = 249$. Thus, we used a total of 249 respondents, which was rounded to 250.

Sampling Method

Multistage sampling was used:

In the 1st stage, two wards were selected from all the 10 political wards in the LGA by balloting. Thus, wards 05 and 10 were selected.

In the 2nd stage, one community was selected in each ward using simple random sampling. The selected communities include Ugbegun and Equare. The PHC facilities in these communities were subsequently selected. Hence, PHC Ugbegun and PHC Equare were selected. In addition, Irrua Specialist Teaching Hospital, located in ward 5, was purposively selected.

In the 3rd stage, pregnant women attending antenatal clinics at the selected health centres were recruited using a stratified sampling technique. This third stage involved the proportional allocation of respondents from selected health centres, based on the average monthly client population at each facility. Thus ISTH 113, Ugbegun PHC 57, and Equare PHC 57. The clients were then selected from these health facilities using systematic random sampling.

Method of Data Collection

The data was collected using an interviewer-based questionnaire. The questionnaire was in four sections. Section A was on the women's socio-demographic data: age, ethnicity, religion, occupation, marital status, number of pregnancies, and age at first pregnancy. Section B questions were on the knowledge of mothers on tetanus toxoid immunization. This was assessed using a 15-point knowledge score. Section C questions were on the perception of mothers towards tetanus toxoid immunization. Section D questions were on their utilization of maternal Neonatal tetanus vaccine.

Respondents' perception of TT was assessed using 9 questions on a 5-point Likert scale (Strongly Agree to Strongly Disagree). The most positive response to any of the questions was given a score of five (5) while the most negative response to any of the questions was given a score of one (1) with a minimum and maximum obtainable score of 9 and 45, respectively. The total score for each respondent was converted to percentage and classified as: negative perception of risk (less than 50%) and positive perception of risk (50% and above).

Pre-testing

The study instruments were pretested in the Esan West Local Government Area. The questionnaire was administered to 10% of the estimated sample size (25) after obtaining mothers' consent.

Data Analysis

The data were analyzed using IBM Statistical Package for Social Sciences (SPSS), version 21 (IBM Corp., Armonk, N.Y., USA), and the results were presented numerically and diagrammatically, e.g., as frequency tables and percentages. The chi-square test was also used to test for statistical associations. The level of statistical significance was set at $p < 0.05$.

Ethical Consideration

The Ethics Review Committee of Irrua Specialist Teaching Hospital (ISTH), Irrua, granted ethical approval. Approval was also obtained from the selected health centres in Esan Central Local Government Area. We obtained respondents' consent after providing clear, complete, and adequate information about the study, and they signed and dated the written informed consent form. The study was conducted in compliance with the Declaration of

Helsinki.

Results

A total of 226 questionnaires were analyzed (giving a response rate of 90.4%).

The age of the respondents (see Table 1) ranged from 22 to 49 years, with most aged 20 to 30 years 136

Table 1: Socio-demographic characteristics of the mothers

Variable	Frequency (n= 226)	Percent (%)
Age Group (Years)		
20 – 30	136	60.2
31 – 40	81	36.8
41 – 50	9	4.0
Mean ± Standard deviation	30.25 ± 5.39	
Minimum	22	
Maximum	49	
Educational status		
No formal education	9	4.0
Primary education	44	19.5
Secondary education	51	22.6
Tertiary education	122	54.0
Marital status		
Single	60	26.5
Married	160	70.8
Devoiced	6	2.7
Religion		
African Traditional Religion	3	1.3
Christianity	179	79.2
Islam	44	19.5
Occupation		
Full housewife	35	15.5
Students	44	19.5
Business/ Trading	2	0.9
Civil servant	93	41.2
Farmer	52	23.0
Ethnic group		
Hausa	22	9.7
Igbo	30	13.3
Youruba	30	13.3
Bini	26	11.5
Ishan	70	31.0
Akoko Edos	15	6.6
Others	33	14.6
Number of children		
This pregnancy	39	17.3
1	47	20.8
2	61	27.0
3	43	19.0
4	26	11.5
5	10	4.4
Parity		
1st pregnancy	42	18.6
2nd pregnancy	47	20.8
3rd pregnancy	53	23.5
4th pregnancy	37	16.4
5 pregnancies	47	20.8
Current age of pregnancy		
1st trimester	22	9.7
2nd trimester	73	32.3
3rd trimester	131	58.0
Time of antenatal registration		
1st trimester	114	50.4
2nd trimester	92	40.8
3rd trimester	20	8.8
Awareness of Tetanus		
Yes	226	100
No	0	0
Awareness of Tetanus toxoid		
Yes	203	90
No	23	10

(60.2%). Most, 122 (54.0%) have a tertiary education, and 70.8%, 79.2%, and 41.2% of the mothers were married, Christian, and civil servants, respectively. The Ishan ethnic group, 70 (31.0%) was dominant, and mothers who already had two children (27.0%) were more than others. On parity, mothers with 3 pregnancies, 53 (23.5%) were most predominant, and the majority of the mothers were in their 3rd trimester, 131 (58.0%) at the time of this study. Also, 114 (50.4%) of mothers reported registering for antenatal services for the current pregnancy in the 1st trimester.

Table 2: Knowledge of mothers on tetanus toxoid immunization and sources of information

Questions	Correct answer (%)	
	No	Yes
What immunization is?	67 (29.6)	159 (70.4)
What is tetanus?	104 (46.0)	122 (54.0)
Causes of tetanus toxoid	69 (30.5)	157 (69.5)
What tetanus toxoid vaccination is/does	94 (41.6)	132 (58.4)
How many doses are given during childhood	158 (69.9)	68 (30.1)
When the 6 th dose is given taken	150 (66.4)	76 (33.6)
Recommended duration of additional doses	100 (44.2)	126 (55.8)
Schedule for tetanus toxoid immunization	127 (56.2)	99 (43.8)
If maternal tetanus toxoid immunization protects the unborn child before and after birth	111 (49.1)	115 (50.9)
During pregnancy tetanus vaccine is given in combination with?	84 (37.2)	142 (62.8)

Regarding the mother's knowledge of tetanus toxoid immunization, 159 (70.4%) know what immunization is, but only 122 (54.0%), 157 (69.5%) and 132 (58.4%) know about tetanus, its causes, and what tetanus toxoid vaccination does, respectively. Only 68 (30.1%) know the number of doses given during childhood, but 76 (33.6%) and 126 (55.8%) know when the 6th dose should be given and the interval between additional doses. Also, 99 (43.8%) know the schedule for the immunization, while 115 (50.9%) and 142 (62.8%) know that maternal tetanus toxoid immunization protects the unborn child before and after birth, the combination of other vaccines given with tetanus during pregnancy and that maternal neonatal immunization prevents mothers and children from tetanus disease, respectively (Table 2)

From Figure 1, 88 (38.9%) of the mothers had a good knowledge of tetanus toxoid immunisation, while 95 (42.0%) had a fair knowledge, and 43 (19.0%) had a poor knowledge. Regarding the mothers' sources of information, 54 (23.9%) and 53 (23.5%) were from

the mass media and friends/relations, respectively. However, most mothers 101 (44.7%) received information on tetanus toxoid vaccines during antenatal clinics, while 18 (7.9%) received it from other sources (including church, mosque, and markets).

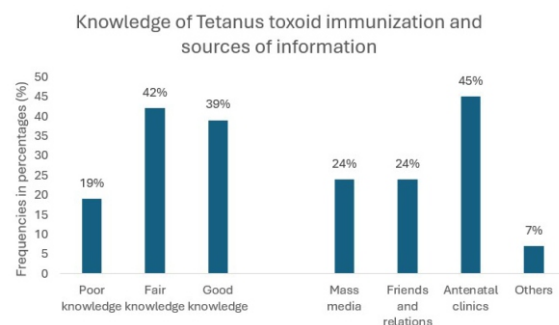


Figure 1: Knowledge of mothers of tetanus toxoid immunization and sources of information

Table 3: Association between the socioeconomic status of the mother and the knowledge of tetanus toxoid immunization

Variable	Level of knowledge (n=226)			X2	p-value
	Poor	Fair	Good		
Age (years)					
20 – 30	32(23.5)	48(35.3)	56(41.2)		
31 – 40	8(9.9)	47(58.0)	26(32.1)	19.087	0.001*
41 – 50	3(33.3)	0(0.0)	6(66.7)		
Highest level of education					
No formal education	0(0.0)	9(100.0)	0(0.0)		
Primary education	19(43.2)	19(43.2)	6(13.6)		
Secondary Education	12(9.8)	23(45.1)	16(31.4)	48.210	0.000*
Tertiary Education	43(19.0)	44(36.1)	66(54.1)		
Occupation					
Full housewife	17(48.6)	9(25.7)	9(25.7)		
Student	6(13.6)	15(34.1)	23(52.3)		
Business/Trader	0(0.0)	2(100.0)	0(0.0)		
Civil servant	14(15.1)	54(58.1)	25(26.9)	45.269	0.000*
Farmer	6(11.5)	15(28.8)	31(59.6)		

*p<0.05 for statistically significant variables

Table 3 reveals the association between some socioeconomic status of mothers and the knowledge of tetanus toxoid immunization. Mothers' age (p=0.001), educational status (p=0.001), and occupation (p=0.001) were statistically associated with their knowledge of tetanus toxoid, with better knowledge among older respondents and those with higher educational qualifications. The students and farmers also had better knowledge.

Table 4. Regarding the factors affecting mothers' perception of tetanus toxoid immunization, 88 (38.9%), 35 (15.5%), 52 (23.0%), and 52 (23.0%) strongly agreed that accessibility of vaccination

sites; Health workers' attitude; quality of service and cancellation of vaccine schedules are problems respectively. However, some reported side effects from the tetanus vaccine 58 (25.7%), even though 103(45.6%) and 82(36.3%) strongly agree and agree respectively that the tetanus vaccine is good for the mother and newborn. An analysis of the perception showed that 27(11.9%) of mothers had a negative perception, while 199 (88.1%) had a positive perception towards tetanus toxoid immunization.

Table 4: Perception and factors affecting perception of mothers towards tetanus toxoid immunization

Variable	Frequency (n= 226)	Percent (%)
Perception		
Negative perception	27	11.9
Positive perception	199	88.1
Access to vaccination is a problem.		
I strongly agree	88	38.9
Agree	52	23.0
Indifferent	15	6.6
Disagree	68	30.1
Strongly disagree	3	1.3
Health workers are not encouraging.		
I strongly agree	35	15.5
Agree	58	25.7
Indifferent	24	10.6
Disagree	100	44.2
Strongly disagree	9	4.0
The quality of service given is a problem.		
I strongly agree	40	17.7
Agree	65	28.8
Indifferent	24	10.6
Disagree	94	41.6
Strongly disagree	3	1.3
Cancellation of the vaccine schedule by a health worker is a problem.		
I strongly agree	52	23.0
Agree	64	28.3
Indifferent	35	15.5
Disagree	69	30.5
Strongly disagree	6	2.7
Side effects from tetanus vaccine is a problem.		
I strongly agree	58	25.7
Agree	67	29.6
Indifferent	46	20.4
Disagree	52	23.0
Strongly disagree	3	1.3
Tetanus vaccine is good for mother and newborn.		
I strongly agree	103	45.6
Agree	82	36.3
Indifferent	13	5.8
Disagree	25	11.1
Strongly disagree	3	1.3

Table 5 shows the relationship between mothers' socioeconomic status and perception of tetanus toxoid immunization. The results showed that age does not positively influence mothers' perception, but education and occupation do. Statistically, mothers' age ($p=0.120$) was not significantly associated, whereas mothers' educational status ($p=0.027$) and occupation ($p=0.000$) were significantly associated with healthy perception.

Table 5: Relationship between mothers' socioeconomic status and their perception towards tetanus toxoid immunization

Variable	Perception (n=226)	X ²	p-value
Age (years)	Negative Positive		
20 – 30	16(11.8)	120(88.2)	4.247 0.120
31 – 40	8(9.9)	73(90.1)	
41 – 50	3(33.3)	6(66.7)	
Highest level of education			
No formal education	3(33.3)	6(66.7)	9.195 0.027*
Primary education	5(11.4)	39(88.6)	
Secondary Education	10(19.6)	41(80.4)	
Tertiary Education	9(7.4)	113(92.6)	
Occupation			
Full housewife	3(8.6)	32(91.4)	21.399 0.000*
Student	3(6.8)	41(93.2)	
Business/Trader	2(100.0)	0(0.0)	
Civil servant	8(8.6)	85(91.4)	
Farmer	11(21.2)	41(78.8)	

* $p<0.05$ for statistically significant variables.

Being positive for those with higher educational levels, for students, and for civil servants.

On vaccination utilization, 158 (70.0%) of the mothers had their vaccination card with them, and 125 (55.3%) said they had taken the TT vaccine, but 26(11.5%) of the mothers did not know if they had taken the vaccine. Of the tetanus toxoid recipients, 17(7.5%) had not received any dose, while 53(23.5%), 42(18.6%), 68(30.1%), and 46 (20.4%)

Table 6: Utilization of maternal neonatal tetanus vaccine

Variable	Frequency (n= 226)	Percent (%)
Have you taken the MNT vaccine?		
Yes	125	55.3
No	75	33.2
I don't know	26	11.5
I have experience with vaccination delay		
Yes	126	55.8
No	100	44.2
I have missed vaccination before		
Yes	104	46.0
No	122	54.0
There are period that at least one vaccine has never been given to me before		
Yes	113	50.0
No	113	50.0
How far is the health center or facility to you?		
Less than 15 mins	66	29.2
15 to 30 mins	85	37.6
31 mins to 1 hr.	35	15.5
1 hour plus	40	17.7
Did you receive vaccination during your previous pregnancy?		
Yes	131	58.0
No	95	42.0
Experienced side effect on vaccine		
Fever	25	11.1
Headache	17	7.5
Pain only	43	19.0
Pain and vomiting	6	2.6
No response	135	59.7
Level of utilization		
Good level of utilization	166	73.5
Poor level of utilization	60	26.5

received the 1st, 2nd, 3rd, and 4th doses. Also, 126 (55.8%), 104 (46.0%), and 113 (50.0%) reported experiencing vaccination delays or missed vaccinations, and that there were periods during which at least one vaccine was never given to them. Most mothers (37.6%) reported that the time to reach the health facility was between 15 and 30 minutes, and the majority (58.0%) reported having received a vaccination in their previous pregnancy. Among experienced side effects with vaccination, pain only (19.0%) was the most reported, while others reported fever (11.1%), headache (7.5%), and pain and vomiting (2.6%). As regards the level of utilization, 60 (26.5%) of the mothers poorly utilize the maternal neonatal tetanus vaccine and vaccination schedule,

Table 7: Association between mothers' socioeconomic status and their level of utilization of maternal neonatal tetanus vaccine

Variable	Level of utilization (n=226)		X ²	p-value
	Good	Poor		
Age (years)				
20 – 30	100(73.5)	36(26.5)	0.229	0.892
31 – 40	60(74.1)	21(25.9)		
41 – 50	6(66.7)	3(33.3)		
Highest level of education				
No formal education	3(33.3)	6(66.7)	16.164	0.001*
Primary education	29(65.9)	15(34.1)		
Secondary Education	33(64.7)	18(35.3)		
Tertiary Education	101(82.8)	21(17.2)		
Occupation				
Full housewife	26(74.3)	9(25.7)	31.994	0.000*
Student	44(100)	0(0.0)		
Business/Trader	0(0.0)	2(100.0)		
Civil servant	55(59.1)	38(40.9)		
Farmer	42(78.8)	11(21.2)		

* <0.05 for statistically significant variables.

while 166 (73.5%) have a good level of utilization (table 6).

Regarding the relationship between mothers' socioeconomic status and the level of tetanus toxoid immunization utilization, the results showed that age ($p=0.892$) did not influence mothers' level of utilization. However, education ($p=0.001$) and occupation ($p=0.000$) were significantly associated with mothers' level of immunization utilization.

Discussion

The primary aim of this study was to evaluate the level of knowledge and uptake of tetanus toxoid immunization among mothers in Esan Central Local Government Area of Edo State, Nigeria. The study sites included Irrua Specialist Teaching Hospital (purposely selected), PHC Ugbegun, and PHC Eguare. Results on the socio-demographic

characteristics of the respondents showed that the age of the pregnant women ranged from 22 to 48 years, with the majority in the 22-30 years age group (mean age was 30.25 ± 5.39). The high representation of this age group is linked to females' reproductive age. Most of the pregnant women were educated, married, Christian, civil servants and of the Ishan ethnic group. This is expected, given that the area is in Nigeria's South-South geopolitical zone, which is predominantly Christian and is well-endowed with educational institutions and infrastructure.¹⁹ Moreover, the area houses a federal health facility and the state-owned Ambrose Alli University in Ekpoma, which is approximately a 10-minute drive away. All these may have favoured the area in terms of education and employment. Majority of the women already have 2 children, and with a parity of 3. Interestingly, most of the women registered for antenatal services in their first trimester. This may be due to women's educational status, coupled with the availability of health and educational facilities.

From this study, all the respondents were aware of tetanus disease, and 90% were aware of tetanus toxoid immunization. This is similar to a previous report from South-South Nigeria, where 98.1% and 97.2% were aware of tetanus and tetanus toxoid, respectively.²⁰ It is also comparable to another report from North-West Nigeria, in which 87.0% of the respondents were aware of tetanus toxoid.²¹ The finding was also consistent with a previous report from Lagos, where 89% of the respondents were aware of tetanus immunization.¹² This impressive finding may not be unrelated to the nature of the study setting, with respect to education and the repeated campaigns carried out with respect to tetanus immunization and other vaccine-preventable diseases.²² Moreover, It was observed that more than a third of the women (44.7%) obtained their tetanus information from antenatal clinics. This finding is at variance with results from previous studies in North-West, Nigeria and the Niger-Delta region, where 62% and 100% of the respondents received information about tetanus immunization from health workers, respectively.^{21,23} Other major sources of information, reported in this survey, included mass media and friends and relations.

Regarding women's knowledge of tetanus toxoid immunization, the results of this study revealed that about four-fifths of the respondents had at least fair knowledge, while only 19% had poor awareness.

This finding is incongruous with a previous report by Komal Bint et al., in Pakistan, where only 8.88% of the women had good knowledge about tetanus infection and the vaccine.²⁴ The findings are also at variance with another report from South-South Nigeria,²⁵ which revealed very poor knowledge on maternal and neonatal tetanus despite 3 phases of campaigns. However, it was slightly comparable to the results from Benue State, Nigeria,²⁶ where 46.0% of women were reported to have fair knowledge of Tetanus toxoid. The relatively higher results observed in this study may not be unrelated to the women's levels of education and socioeconomic status.²⁷

In this study, there was a statistically significant association between respondents' knowledge of tetanus toxoid and their age, level of education, and occupation. This is consistent with reports from studies carried out in South-West Nigeria,²⁸ where age, educational status and occupation were significantly associated with knowledge and uptake of tetanus-containing vaccine. Indeed, the association of knowledge with these factors may be related to the significance of education and occupation, which are major components of these women's social status and influence their access to health information.²⁷

Nonetheless, in this study, pregnant women were observed to have a healthy perception towards tetanus toxoid immunization. In fact, 88.1% of the women had a healthy perception, and 81.9% agreed that the tetanus vaccine is good for mothers and newborns. This is at variance with results from North-West Nigeria,²¹ where 36.7% and 21.5% of the respondents believed that tetanus has no benefit and feared harm to themselves and their babies, respectively. The findings from this study were also at variance with another report, where 48.0% of the respondents believed that their culture forbade taking TT immunization during pregnancy, while 36.7% opined that TT immunization could harm their babies, and 47.3% believed that TT immunization had nothing to do with diseases in children.²⁶ The healthy perception in this study may not be unrelated to the women's knowledge of tetanus immunization. It is known that knowledge significantly influences attitudes and behaviours, and it is evident that poor maternal knowledge not only affects a woman's vaccination status but also hinders infant vaccination.²⁷ However, some of the

women stated that accessibility, health workers' attitude, quality of services, schedule cancellation, and side effects are some of the factors that may hinder uptake of vaccines. In this study, education and occupation significantly affected respondents' perceptions of TT vaccination, whereas age did not.

In addition, TT vaccine uptake was 73.5%. This is significantly higher than the results from North-West Nigeria, where 23.6% of the respondents had received two or more doses of the vaccine.²¹ This finding is comparable with reports from South-West Nigeria, where 71% of the women attending the antenatal clinic had received two doses of the TT vaccine.²⁸ The high uptake of TT in this study may be due to the sociodemographic profile of the pregnant women, particularly their education and occupation.

Conclusion

This study showed that over four-fifths of the respondents had a good level of awareness of tetanus and toxoid immunization. In addition, about four-fifths of the respondents had at least a fair knowledge tetanus toxoid immunization

Respondents' knowledge of tetanus toxoid was statistically associated with age, level of education, and occupation, with older respondents and those with higher educational qualifications having better knowledge. The students and farmers also had better knowledge. Moreover, 88.1% of the respondents have a healthy perception towards tetanus toxoid immunization.

Common hindrances to uptake of the vaccines included negative attitude by some health workers; poor service quality; cancellation of scheduled services; and perceived side effects of vaccines

Nonetheless, there is a statistically significant association between the respondent's perception of TT immunization and her level of education and occupation. This was positive among those with higher educational levels, students and civil servants. Slightly less than three-quarters of the respondents had received at least two doses of TT vaccine.

Recommendations

Health education should be continuous and sustained at the primary, secondary, and tertiary levels of care. This should also be carried out in schools at all levels. Health workers should be trained and retrained in their attitudes towards clients, the quality of services rendered and the need to stick to their schedules in

health care delivery.

Public health institutions should adopt feedback mechanisms from clients, especially concerning immunization services.

Limitation: The purposive selection of Irrua Specialist Teaching Hospital, Irrua

Conflicts of interest: There are no conflicts of interest

References

1. Raza SA, Avan BI. Eliminating Maternal and Neonatal Tetanus and Promoting Clean Delivery Practices through Disposable Clean Birth Kits. *Front Public Health*. 2019;7:339.10.3389/fpubh.2019.00339.
2. World Health Organisation. Protecting All against Tetanus: Guide to Sustaining Maternal and Neonatal Tetanus Elimination (MNTE) and Broadening Tetanus Protection for All Populations.2019, <https://creativecommons.org/licenses/by-nc-sa/3.0/igo><https://creativecommons.org/licenses/by-nc-sa/3.0/igo>.
3. Thwaites CL, Beeching NJ, Newton CR. Maternal and Neonatal Tetanus. *The Lancet*. 2015;385(9965):362-70.10.1016/S0140-6736(14)60236-1.
4. Aboagye RG, Amu H, Dowou RK, Bansah P, Oaikhenia IO, LE B. Prevalence and Correlates of Tetanus Toxoid Uptake among Women in Sub-Saharan Africa: Multilevel Analysis of Demographic and Health Survey Data. *PLoS ONE*. 2023;18(12):e0296174.<https://doi.org/10.1371/journal.pone.0296174>
5. World Health Organisation. Tetanus. 2023, <https://www.who.int/news-room/fact-sheets/detail/tetanus>.
6. Owusu-Darko S, Diouf K, Nour NM. Elimination of Maternal and Neonatal Tetanus: A 21st-Century Challenge. *Reviews in obstetrics & gynecology*. 2012;5(3-4):e151-7.
7. Lawn JE, Cousens S, Zupan J. 4 Million Neonatal Deaths: When? Where? Why? *The Lancet*. 2005;365(9462):891-900.10.1016/S0140-6736(05)71048-5..
8. Kyu HH, Mumford JE, Stanaway JD, Barber RM, Hancock JR, Vos T, et al. Mortality from Tetanus between 1990 and 2015: Findings from the Global Burden of Disease Study 2015. *BMC Public Health*. 2017;17(1):179.10.1186/s12889-017-4111-4.
9. World Health Organisation. Maternal and Neonatal Tetanus Elimination, 2020. 2020;https://www.who.int/reproductivehealth/publications/maternal_perinatalhttps://www.who.int/reproductivehealth/publications/maternal_perinatal.
10. Muhammad-Idris ZK, Shehu AU, Isa F. Assessment of Tetanus Toxoid Coverage among Women of Reproductive Age in Kwarbai, Zaria. *Archives of Medicine and Surgery*. 2017;2:48 - 54.
11. Demicheli V, Barale A, Rivetti A. Vaccines for Women for Preventing Neonatal Tetanus. *Cochrane Database of Systematic Reviews*. 2015;10.1002/14651858.CD002959.pub4(7)10.1002/14651858.CD002959.pub4.
12. Sule SS, Nkem-Uchendu C, Onajole AT, Ogunowo BE. Awareness, Perception and Coverage of Tetanus Immunisation in Women of Childbearing Age in an Urban District of Lagos, Nigeria. *Nigerian Postgraduate Medical Journal*. 2014;21(2):107-14. https://journals.lww.com/npmj/fulltext/2014/21020/awareness,_perception_and_coverage_of_tetanus.1.aspx.
13. Olufunmilayo Kuye-Kuku T, Motunrayo Akinlusi F, Haleemah Olalere FD, Onyinyechi Chionuma J, Abiodun Oshodi Y, Abimbola Ottun T. Awareness, Adherence and Determinant Factors among Pregnant Mothers on Lifelong Tetanus Toxoid Vaccination as Part of the National Immunization Scheme. *Journal of Advances in Medicine and Medical Research*. 2022;34(8):27-34. <https://hal.science/hal-05186792>.
14. Thwaites CL, Loan HT. Eradication of Tetanus. *British Medical Bulletin*. 2015;116(1):69-77.10.1093/bmb/ldv044.
15. Orimadegun AE, Adepoju AA, Akinyinka OO. Adolescent Girls' Understanding of Tetanus Infection and Prevention: Implications for Disease Control in Western Nigeria. *Front Public Health*. 2014;2:24.10.3389/fpubh.2014.00024.
16. Morhason-Bello I, Kareem YO, Illah O, Akinyemi JO, Abdus-Salam R, Lawal O, et al. Factors Associated with the Uptake of Antenatal Tetanus Toxoids Containing Vaccine by First-Time Mothers in Nigeria: Findings from the 2018 Nigerian Demographic Health Survey. *Journal of Pregnancy*. 2022;2022:7607993.10.1155/2022/7607993.

- 607993.
17. Gebremedhin TS, Welay FT, Mengesha MB, Assefa NE, Werid WM. Tetanus Toxoid Vaccination Uptake and Associated Factors among Mothers Who Gave Birth in the Last 12 Months in Error District, Somali Regional State, Eastern Ethiopia. *BioMed Research International*. 2020;2020:4023031.10.1155/2020/4023031.
 18. Araoye MO. *Research Methodology with Statistics for Health and Social Sciences*. 2nd ed. Ilorin: Nathadex Publisher; 2004 March 2004.
 19. Federal Ministry of Health and Social Welfare of Nigeria (FMOHSW), National Population Commission (NPC) [Nigeria], and ICF. *Nigeria Demographic and Health Survey 2023–24: Key Indicators Report*. Nigeria, and Rockville, Maryland, USA: NPC and ICF; 2024.
 20. Abah MG, Asuquo OA, Inyangetoh EC. Knowledge and Behaviour Towards Tetanus Toxoid Immunisation in South-South, Nigeria: Findings from Antenatal Clinic Attendees. *Asian Journal of Applied Sciences*. 2019;7(5)10.24203/ajas.v7i5.5785.
 21. Awosan KJ, Hassan M. Perception and Utilization of Tetanus Toxoid Immunization among Pregnant Women Attending a Tertiary Centre in North-West Nigeria. *Journal of Drug Delivery and Therapeutics*. 2018.
 22. Madubuike G, Asoquo EO, Orji V. Perception of Tetanus Toxoid Immunization among Women in a Niger Delta Community, Nigeria. *International Journal of TROPICAL DISEASE & Health*. 2018;23(3):1-8.10.9734/IJTDH/2017/32391.
 23. Madubuike G, Asoquo EO, V O. Perception of Tetanus Toxoid Immunization among Women in a Niger Delta Community, Nigeria. *International Journal of TROPICAL DISEASE & Health*. 2018;23(3):1-8.10.9734/IJTDH/2017/32391.
 24. Ajmal DKBe, Azam DN, Pervaiz DF, Akhtar DSS, Mahmood DH, Yousaf DS. Knowledge Attitude and Practices Regarding Tetanus Toxoid Vaccination in Reproductive Age Women (15-49). A Descriptive Cross-Sectional Study in Pakistan Emirates Military Hospital, Rawalpindi. *Pakistan Armed Forces Medical Journal*. 2019;69(SUPPL 2):S334-39. <https://pafmj.org/PAFMJ/article/view/2900>.
 25. Alex-Hart BA, Okoh BAN. Awareness and Status of Tetanus Toxoid Vaccination among Female Undergraduate Students in a Nigerian University. *International Journal of Tropical Disease & Health*. 2015;7(1):6-15.10.9734/IJTDH/2015/15468.
 26. Ogbeyi OG, Gbahabo DD, Afolarani T. Knowledge, Beliefs and Practices Regarding Tetanustoxoid Immunization among Nursing Mothers in Benue State, North Central, Nigeria. *The International Annals of Medicine*. 2017;1.
 27. Babalola S, Fatusi A. Determinants of Use of Maternal Health Services in Nigeria-Looking Beyond Individual and Household Factors. *BMC Pregnancy Childbirth* 2009;9(43):10.1186/1471-2393-9.
 28. Kuku OK, Akinlusi FM, Olalere FDH, Chionuma J, Yusuf AO, Ottun TA. Awareness, Adherence and Determinant Factors among Pregnant Mothers on Lifelong Tetanus Toxoid Vaccination as Part of the National Immunization Scheme. *Journal of Advances in Medicine and Medical Research*. 2022;34(8):27-34. <https://hal.science/hal-05186792>.