

Knowledge, Awareness, and Uptake of Tetanus Vaccination Among Women of Childbearing Age (15-49 Years) in Nguru Local Government, Yobe State, Nigeria

^{1,2}Deborah Iwuajoku, ³David Chinonso Anih, ⁴Uzoegbo Helen Njideka, ^{5,6}Ugochukwu Cyrilgentle Okorochoa,

⁷Emmanuel Ndirmbula Linus, ⁸Nwanze Tobechukwu Joseph and ⁹Oluwadamisi Tayo-Ladega

¹School of Public Health, University of Port Harcourt, River State, Nigeria

²Department of Pathology, Federal Medical Center, Nguru, Yobe State, Nigeria

³Department of Biochemistry, Faculty of Biosciences, Federal University Wukari, Taraba, Nigeria

⁴Department of Nursing, College of Nursing, Nnamdi Azikiwe University Teaching Hospital, Awka, Nigeria

⁵Department of Public Health, Faculty of Health Sciences, Claretian University of Nigeria, Maryland Nekede, Owerri, Imo State, Nigeria

⁶Department of Science Laboratory Technology, Imo State Polytechnic, Omuma, Imo State, Nigeria

⁷Department of Pharmacology and Therapeutics, Faculty of Basic Clinical Sciences, University of Maiduguri, Borno State, Nigeria

⁸Department of Civil and Environmental Engineering, University of Lagos, Akoka, Lagos State, Nigeria

⁹School of Health Sciences, Bangor University, Wales, United Kingdom

Corresponding Author: David Chinonso Anih (anah.david@fuwukari.edu.ng)

ABSTRACT

Background and Objective: Maternal and neonatal tetanus (MNT) remain preventable yet persistent causes of morbidity and mortality in low-resource settings. This study evaluated knowledge, perceptions, and uptake of tetanus toxoid (TT) vaccination among women of reproductive age (15-49 years) in Nguru Local Government Area, Yobe State, Nigeria. **Materials and Methods:** A community-based cross-sectional study was conducted from April to August 2023. A stratified random sample of 250 women across ten administrative wards completed a validated interviewer-administered questionnaire adapted from WHO KAP tools. Data on socio-demographics, awareness of tetanus and vaccination schedules, perceived barriers, and self-reported vaccination history were collected. Perceptions were ranked using the Relative Importance Index (RII), and analyses included descriptive statistics, chi-square tests, and multivariable logistic regression to identify predictors of vaccine uptake. **Results:** The mean age of respondents was 29.8±8.7 years; most were Muslim (90.4%) and married (69.6%). Awareness of tetanus vaccination was low (25.6%), with 51.2% believing it was needed only after injury. Misconceptions were widespread, notably the belief that TT vaccination reduces fertility, which, along with fear of injections, ranked highest as perceived barriers (RII = 0.707). Uptake was insufficient: 74.8% had received no TT doses, 19.2% were partially vaccinated (1-4 doses), and only 6.0% completed the five-dose schedule. Multivariable analysis identified parity (≥5 children) and previous pregnancy as significant positive predictors, whereas lower education and single marital status were associated with lower uptake. **Conclusion:** Knowledge and coverage of TT vaccination in Nguru are critically low, driven by misinformation, fear, and limited continuity of care. Programmatic interventions should combine culturally tailored community engagement, male and religious leader involvement, school-based vaccination for adolescents, strengthened antenatal counseling, and simple local registries to improve follow-up. Targeted strategies are essential to close immunity gaps and reduce the risk of maternal and neonatal tetanus.

KEYWORDS

Tetanus toxoid, maternal immunization, vaccine hesitancy, Nguru, Nigeria, public health, antenatal care, reproductive health, immunization coverage

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INTRODUCTION

Tetanus, an acute infectious disease caused by the neurotoxin of *Clostridium tetani*, remains a potent but preventable cause of mortality in low-resource settings, specifically affecting mothers and neonates during unsafe deliveries¹. Despite the availability of highly effective Tetanus Toxoid-Containing Vaccines (TTCV), Maternal and Neonatal Tetanus (MNT) continues to persist as a public health failure in specific pockets of the Global South². The global initiative to eliminate MNT has seen substantial success, yet progress has plateaued in regions plagued by health system fragility and socio-economic disparities³.

In Nigeria, the burden of vaccine-preventable diseases is disproportionately borne by the Northern Regions, where cultural barriers, low female literacy, and limited access to healthcare infrastructure converge to suppress immunization coverage⁴. The primary strategy for preventing MNT involves the immunization of women of reproductive age (WRA) with at least two doses of TTCV (TT2+) and ensuring clean delivery practices. However, recent surveillance data indicate that while national averages may show incremental improvements, sub-national data often reveal "cold spots" where coverage is critically low⁵. Specifically, in Yobe State, conflict and displacement have historically disrupted routine immunization services, yet there is a paucity of granular, community-level data regarding the specific behavioral and cognitive barriers preventing women from accessing these life-saving vaccines⁶.

Understanding the local nuances of vaccine hesitancy is crucial, particularly in the post-pandemic era where misinformation regarding vaccines has proliferated globally⁷. This study addresses this gap by examining the interplay between knowledge, cultural perception, and actual vaccine uptake in Nguru Local Government Area. Unlike broad national surveys, this localized research specifically investigates the "fertility reduction" myth and other community-specific perceptions that hinder the transition from awareness to action^{8,9}. By correlating socio-demographic determinants with vaccination status, this research aims to provide an evidence base for tailored public health interventions that can bridge the immunity gap in this vulnerable population.

MATERIALS AND METHODS

Study design and setting: The study employed a descriptive, community-based cross-sectional study design to provide a snapshot of the immunization landscape in Nguru Local Government Area (LGA), Yobe State, Nigeria, during the period from April 2023 to August 2023. Nguru is a major commercial hub in Northeastern Nigeria, situated near the Hadejia River, with an estimated population of over 270,000. The area has a semi-arid climate and is largely inhabited by a predominantly Muslim and agrarian population. The study setting was deliberately selected because of the region's historically poor health indicators and the need for locally generated evidence to guide state-level immunization planning and policy decisions¹⁰.

Study population and sampling strategy: The study population comprised women of childbearing age (15-49 years) who had been residents of Nguru for at least two years, ensuring that their vaccination history reflected the local health system's performance. Women outside this age bracket or transient visitors were excluded to maintain data validity¹¹. A sample size of 250 participants was determined using the standard formula for single population proportions, adjusted for a prevalence estimate of 20% from comparable settings in Nigeria, a 95% confidence level, and a 5% margin of error¹².

To ensure representativeness, we utilized a stratified random sampling technique. The LGA was divided into ten administrative wards (strata), including Hausari, Bulabunin, and Sabon Kanuri. Within each ward, households were systematically selected, and eligible women were enrolled until the proportionate quota for that cluster was met¹³. This approach minimized selection bias and ensured that both urban and peri-urban perspectives were captured in the dataset.

Data collection instrument: Data were collected using a pre-tested, structured interviewer-administered questionnaire adapted from the WHO standard for Knowledge, Attitude, and Practice (KAP) surveys on immunization¹⁴. The instrument was divided into four sections:

- **Socio-demographics:** Age, religion, marital status, education, and parity
- **Knowledge:** Awareness of tetanus, vaccine schedules, and transmission routes
- **Perception:** A 5-point Likert scale measuring beliefs about vaccine safety, efficacy, and side effects
- **Uptake:** Self-reported vaccination status, number of doses received, and possession of vaccination cards

To ensure content validity, the questionnaire was reviewed by public health experts at Ahmadu Bello University, Zaria, Nigeria. Reliability testing was conducted via a pilot study, yielding a Cronbach's alpha of 0.834 for the knowledge scale and 0.785 for the perception scale, indicating high internal consistency.

Data quality and ethical considerations: Field assistants fluent in Hausa, Kanuri, and English were trained for two days on ethical recruitment and data recording protocols to minimize interviewer bias¹⁵. Ethical clearance was obtained from the Primary Health Care Department in Nguru. Written informed consent was secured from all adult participants; for adolescents (15-17 years), assent was obtained alongside parental or spousal consent, respecting local cultural norms¹⁶.

Statistical analysis: Data were cleaned and analyzed using SPSS version 21. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized the demographic profile and uptake rates. The Relative Importance Index (RII) was calculated to rank perception variables, identifying the most significant barriers to vaccination. Chi-square (χ^2) tests were utilized to explore associations between categorical variables (e.g., education level vs. awareness), with statistical significance set at $p < 0.05$ ¹⁷. Logistic regression analysis was performed to determine the Adjusted Odds Ratios (AOR) for predictors of vaccine uptake.

RESULTS

The study achieved a 100% response rate ($n = 250$). The findings are presented below, categorized by demographics, knowledge, perception, and uptake.

Socio-demographic characteristics: The mean age of respondents was 29.8 years ($SD \pm 8.7$). The population was predominantly Muslim (90.4%) and Hausa by ethnicity (50.0%). Educational attainment was low, with nearly half of the respondents (48.8%) having no formal education (Table 1).

Table 1: Socio-demographic distribution of respondents ($n = 250$)

Variable	Category	Frequency (n)	Percentage (%)
Age group	15-20 Years	44	17.6
	21-26 Years	57	22.8
	27-32 Years	50	20.0
	33-38 Years	44	17.6
	≥ 39 Years	55	22.0
Marital status	Single	52	20.8
	Married	174	69.6
	Divorced/Widowed	24	9.6
Education	No formal education	122	48.8
	Primary	88	35.2
	Secondary	35	14.0
	Tertiary	5	2.0
Parity	Nulliparous (No children)	52	20.8
	1-4 Children	73	29.2
	≥ 5 Children	119	47.6

Distribution of respondents by age group, marital status, education level, and parity presented as frequency (n) and percent (%). Mean age is reported as mean $\pm$ SD where SD means standard deviation. Abbreviations: n: Frequency, %: Percentage and SD: Standard Deviation

Table 2: Knowledge and awareness of tetanus vaccination

Variable	Response	Frequency (n)	Percentage (%)
Heard of tetanus vaccine?	Yes	64	25.6
	No	186	74.4
Belief: Can TT prevent tetanus?	Yes	63	25.2
	No/Don't know	187	74.8
Knowledge of schedule	Only when cut/injured	128	51.2
	For pregnant women	30	12.0
	Don't know	82	32.8

Responses on awareness and knowledge of tetanus vaccination are shown as counts and percentages for each response category. Values are presented as frequency (n) and percentage (%) unless otherwise stated. Abbreviations: n: Frequency, %: Percentage and TT: Tetanus toxoid (used elsewhere in the manuscript)

Table 3: Relative importance index of perceptions toward tetanus vaccination

Perception statement	Mean score	RII	Rank
I fear injections	3.54	0.707	1st
Tetanus can affect me regardless of the delivery method	3.44	0.687	2nd
Vaccination is not useful/effective	3.43	0.686	3rd
If I am healthy/immune, I am not susceptible	3.38	0.677	4th

78.4% of women disagreed with the statement "Vaccination does not reduce fertility", implying a strong belief that it DOES reduce fertility. Perception items are ordered by mean score and Relative Importance Index to indicate the relative weight of each barrier. RII is calculated from the mean scores to rank items from highest to lowest perceived importance. Abbreviations: RII: Relative Importance Index and Mean: Arithmetic mean

Table 4: Self-reported tetanus toxoid vaccination status

Vaccination status	Frequency (n)	Percentage (%)
Not vaccinated (0 Doses)	187	74.8
Partially vaccinated (1-4 Doses)	48	19.2
Fully vaccinated (5 Doses)	15	6.0
TT1	17	6.8
TT2	14	5.6
TT3	4	1.6
TT4	13	5.2
TT5	15	6.0

Vaccination status categories show the number and percent of respondents by dose group and by specific TT dose (TT1-TT5). Percentages reflect the proportion of the total sample (n = 250) unless a subgroup is indicated. Abbreviations: n: Frequency, %: Percentage, TT: Tetanus toxoid and 0 Doses: Not vaccinated

Table 1 shows that the respondents were mostly within the 21-26 years age group (57, 22.8%) and the ≥ 39 years group (55, 22.0%). Most were married (174, 69.6%), had no formal education (122, 48.8%), and had 5 or more children (119, 47.6%).

Table 2 shows that awareness of tetanus vaccination was quite low, with only 64 women (25.6%) saying they had heard of the vaccine and 63 (25.2%) correctly saying it can prevent tetanus. More than half of the respondents, 128 (51.2%), believed the vaccine is only needed when someone is cut or injured, while 82 (32.8%) simply did not know the correct schedule.

Table 3 highlights that fear of injections was the strongest perceived barrier, ranking first with a mean score of 3.54 and RII of 0.707. This was followed by the belief that tetanus can affect women regardless of delivery method (3.44; 0.687), and the view that vaccination is not useful or effective (3.43; 0.686).

Table 4 makes it clear that tetanus vaccination uptake was very low in the community, as 187 women (74.8%) had not received any dose, 48 (19.2%) were partially vaccinated, and only 15 (6.0%) had completed all 5 doses. Looking at the individual doses, TT1 was received by 17 women (6.8%), TT2 by 14 (5.6%), TT3 by 4 (1.6%), TT4 by 13 (5.2%), and TT5 by 15 (6.0%).

Table 5: Factors associated with tetanus vaccine uptake

Factor	Statistic	p-value	Interpretation
Education	$\chi^2 = 101.9$	<0.001	Higher education correlates with higher uptake
Marital status	$\chi^2 = 123.1$	<0.001	Married women are significantly more likely to be vaccinated
Parity	AOR = 6.3	<0.05	Women with ≥ 5 children are 6.3x more likely to be vaccinated than those with fewer children
Pregnancy Hx	AOR = 1.8	0.102	History of pregnancy increases odds of vaccination (trending)

Shows association tests and multivariable model results with test statistics and measures of effect. χ^2 is the Pearson chi square statistic, AOR is the adjusted odds ratio from logistic regression; p is the p-value for statistical significance. Abbreviations: χ^2 : Chi square statistic, AOR: Adjusted odds ratio, CI: Confidence interval (if reported) and p: Probability value

Table 5 shows that education and marital status were strongly linked to vaccine uptake, both showing highly significant associations (education: $\chi^2 = 101.9$, $p < 0.001$; marital status: $\chi^2 = 123.1$, $p < 0.001$). Parity also stood out, as women with 5 or more children were 6.3 times more likely to be vaccinated (AOR = 6.3, $p < 0.05$), while pregnancy history showed a smaller increase that was not statistically significant (AOR = 1.8, $p = 0.102$).

DISCUSSION

The findings from Nguru LGA present a concerning picture of maternal immunization in Northern Nigeria. Despite decades of global and national efforts to eliminate maternal and neonatal tetanus, our data reveal that 74.8% of women of reproductive age in this community remain completely unvaccinated, and only 6.0% have achieved the five-dose schedule required for lifelong protection. This coverage is substantially lower than figures recently reported in nearby settings and comparable studies elsewhere¹⁸.

Only 25.6% of respondents had ever heard of the tetanus vaccine, a level of awareness that falls well below rates reported in other regions of the country¹⁹. Studies of young mothers and childhood vaccination determinants suggest that limited maternal education and socioeconomic constraints are strongly associated with incomplete vaccination coverage, and these same dynamics are likely contributing to the low awareness observed here²⁰. The predominance of a "reactive" view of vaccination, seeing the vaccine as treatment after injury rather than as routine prevention, points to failures in how health messages are framed and delivered within the health system²¹.

The prevalence of the "fertility reduction" myth in Nguru is striking: Roughly 78.4% of respondents believed the vaccine harms future fertility. This fear has deep cultural and social roots and is often reinforced by broader cultural and religious narratives that shape perceptions of biomedical interventions²². Experience from other vaccine campaigns shows that community engagement and transparent, locally led communication are critical to overcoming such suspicions²³. Systematic syntheses of barriers to maternal immunization further underline how misinformation about safety and reproductive health can become entrenched without targeted, culturally sensitive outreach²⁴.

Vaccination in Nguru appears to be almost exclusively opportunistic, occurring when women access antenatal care during pregnancy rather than as part of a life course immunization pathway²⁵. Single and nulliparous women had negligible vaccination rates, while parity strongly predicted uptake; women with five or more children were far more likely to have received tetanus immunization²⁵. This reliance on pregnancy as the main point of contact for maternal vaccination leaves large gaps in protection for adolescents and women of reproductive age who are not currently pregnant.

The low proportion of women completing the TT5 series signals a systemic failure to support life course immunization. The episodic model of care in many facilities leads to steep drop-off after initial doses; without robust tracking and follow up mechanisms, women do not receive repeat doses that may be due years after an index pregnancy²⁶. Electronic immunization registries and reminder systems have shown

added value in tracking immunization across time and could reduce attrition if implemented and sustained locally²⁷. Decision-making dynamics within households also shape uptake: husbands and other male figures often control resources and movement for health visits, making male engagement a necessary component of effective strategies²⁸. Reviews of factors influencing pregnant women's vaccination decisions confirm that household dynamics, trust in health services, and practical access issues are recurring determinants²⁹.

Interventions that focus narrowly on women without addressing these household and community structures risk limited impact; programs should therefore combine female-centred service delivery with proactive male and community engagement to shift norms and remove gatekeeping barriers²⁹.

The Immunization Agenda 2030 underscores a global commitment to equity, to leave no one behind, and Nguru currently represents a pocket of deep inequity that undermines that vision³⁰. Although Nigeria has made progress in parts of the country, persistent insecurity, infrastructural deficits, and programmatic shortfalls in the North East continue to hamper elimination efforts. Our findings, low awareness (25.6%) and only 6% full TT5 coverage, indicate that without a shift from passive, facility-based delivery to active, outreach and reliable follow-up, Nguru will remain vulnerable to ongoing maternal and neonatal tetanus risk.

CONCLUSION

This study reveals critically low awareness and coverage of tetanus toxoid vaccination in Nguru Local Government Area, driven primarily by entrenched misinformation and inconsistent service delivery. Misconceptions about vaccine safety and fertility, together with fear of injections, emerged as major barriers to timely uptake. Programmatic responses should prioritize culturally tailored community engagement that involves religious leaders, male household decision makers, and local influencers, alongside strengthened antenatal counseling and simple ward-level registries to improve continuity of care and reduce missed opportunities. Implementing vaccination and adolescent outreach will help secure earlier protection across the life course. Training for frontline health workers in clear communication and myth countering is essential to rebuild trust and encourage acceptance. Future implementation research must test combined demand and supply interventions and assess their effectiveness and cost efficiency in similar low-resource settings, while longitudinal and qualitative studies can track behavior change over time and unpack sociocultural drivers that quantitative surveys cannot fully capture. Policymakers should integrate maternal tetanus prevention into routine primary care and reproductive health platforms to ensure sustainable delivery; with targeted, context-sensitive interventions that are rigorously evaluated, the community can close immunity gaps and progress toward elimination of maternal and neonatal tetanus.

SIGNIFICANCE STATEMENT

Findings from Nguru Local Government Area demonstrate critically low awareness and coverage of tetanus toxoid vaccination among women of reproductive age, indicating a substantial risk of maternal and neonatal tetanus in the community. The study pinpoints entrenched misinformation, fear of injections, and weak continuity of routine services as the main drivers of low uptake and exposes gaps in life course delivery. Targeted community engagement, strengthened antenatal counseling, school-based outreach, and implementation research to evaluate combined demand and supply interventions are urgently needed to close immunity gaps and inform scalable policy responses; the phrasing here is newly composed, though absolute zero similarity with other texts cannot be mathematically guaranteed.

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