

# Knowledge and Behaviour Towards Tetanus Toxoid Immunisation in South-South, Nigeria: Findings from Antenatal Clinic Attendees

Mathias G. Abah<sup>1\*</sup>, Otobong A. Asuquo<sup>2</sup> and Emmanuel C. Inyangetoh<sup>3</sup>

<sup>1</sup>Department of Obstetrics and Gynecology  
University of Uyo, Nigeria

<sup>2</sup>Department of Obstetrics and Gynecology  
University of Uyo Teaching Hospital, Uyo Nigeria

<sup>3</sup>Department of Obstetrics and Gynecology  
University of Uyo, Nigeria

\*Corresponding author's email: gabriel.abah [AT] rocketmail.com

---

**ABSTRACT**—*Tetanus infection has remained a major health problem in the third world countries despite the availability and accessibility of effective antibodies as vaccines. The knowledge of women about the diseases may affect their behavior with regards to prevention of the disease. This was a descriptive cross sectional study to assess the knowledge and behavior towards tetanus toxoid immunization by 252 antenatal clinic attendees in two health facilities Uyo metropolis. The majority of respondents had heard about Tetanus infection 247(98.1%) and tetanus toxoid (97.2%), with Health workers being the main source of information 213 (85.9%). Most, 228(90.5%) knew it is for prevention, while only 80 (31.7%) were aware 5 doses confer lifetime immunity. Most of the women 236 (93.7%) had received at least a dose of TT; 123(52.1%) had up to 5 doses, while 184(78%) claimed they had completed the immunisation schedule. The commonest reason some had not received any was its not being offered to them (31.3%). There was a global positive attitude towards TT immunisation. The level of education but not age of respondents was statistically associated with being immunized (P=0.001).The study showed a fairly good awareness of tetanus infection and immunisation with misconceptions and a good disposition unmatched by practice. There is therefore the need for proper health education especially on the number of doses, intervals/ schedules, the protection offered, as well as need for the evaluation of the content of health enlightenment information provided by health personnel to mothers attending ANC's*

**Keywords**—Tetanus toxoid, Immunisation, Practice, Attitude, Nigeria

---

## 1. INTRODUCTION

Tetanus infection has remained a major health problem in the third world countries despite the availability and accessibility of effective antibodies as vaccines [1]. It is a life-threatening non-communicable disease caused by toxins produced by the bacterium, *Clostridium tetani* which could exist anywhere. Its spores are found in the soil and dust of most countries [2]. Infection with the bacteria results in the production and release of tetanus toxin which is taken up into the nerve terminals of lower motor neurons (LMNs) that normally activate voluntary muscles. [3] The toxins inhibit the release of gamma amino butyric acid (GABA) and glycine resulting in partial functional denervation of the LMNs and leading to their hyperactivity with increased voluntary muscle activity manifesting as rigidity and spasms [4,5].

Symptomatically, tetanus may manifest as convulsions (seizures), trismus (lockjaw), and severe muscle spasms that could result in bone fractures of the spine, opisthotonus and neck stiffness, with death occurring in 30 to 40 per cent of cases when laryngeal and respiratory muscles are involved. [5,6].The disease affects all age-groups, but neonates who acquire it through umbilical stump contamination and their mothers are mainly at risk, especially following delivery under unhygienic conditions. This occurs in women with suboptimal or no immunisation to protect them and their newborn[1].

A retrospective study on mortality associated with tetanus showed that there were 56,743 deaths due to tetanus in 2015; 19,937 deaths occurred in neonates; and 36,806 deaths in older children and adults, most of which occurred in South Asia, Sub-Saharan Africa and Southeast Asia. [7] Between 1990 and 2015, while the global mortality rate due to neonatal (NNT) and non-neonatal tetanus (NNNT) dropped by 90% and 81% respectively, mortality rates remain high in a number of countries [7]. The highest rates of neonatal tetanus mortality (more than 1,000 deaths per 100,000 population) were

observed in Somalia, South Sudan, Afghanistan, and Kenya while the highest rates of mortality from tetanus after the neonatal period (more than 5 deaths per 100,000 population) were observed in Somalia, South Sudan, and Kenya. [7] Nigeria is a significant contributor to the global burden of neonatal tetanus, and one of the 16 countries that failed the 2015 WHO's elimination goals as assessed in June 2017 [8].

*Clostridium tetani* cannot be eradicated due to its ubiquitous nature, but the infection could be prevented through clean and safe deliveries, clean cord-care practices and maternal immunisation with tetanus toxoid-containing vaccines. [8] The administration of properly spaced doses of tetanus toxoid-containing vaccines (TTCVs) is currently recommended by the WHO during the antenatal period and has been found to reduce the incidence of neonatal tetanus from 88% to 100% and consequently help to achieve elimination of maternal and neonatal tetanus [9,10].

Despite the fact that the vaccine for this disease has been in use successfully for several years, the awareness of its availability for immunization and significance is still low in developing countries considering the number of persons informed and the number of persons that suffer from the disease [8, 11]. The Nigeria national demographic and health survey in 2013 showed that only 51.2% of 13,877 women aged 20 – 34 years received 2 or more tetanus toxoid injections in their last pregnancy [11].

It has been established that the attitude of women towards having tetanus toxoid vaccine to prevent their new-born from the NNT is a representation of their orientation towards the vaccine as well as their readiness to receive tetanus toxoid vaccine as a means of preventing their new-born children from contacting NNT [12]. That the knowledge of women about the diseases affects their behavior with regards to prevention of the disease forms the basis for this study..

## **2. JUSTIFICATION OF STUDY**

The need for preventive health care reviews among women and children cannot be overemphasized. This can be illustrated using tetanus, a vaccine-preventable disease as an example. The high burden of tetanus infection in our society despite availability of vaccines provides a justification for this study. The findings of this study will contribute to the body of knowledge on awareness and behavior towards toxoid immunization among pregnant women in the health care setting and also promote endeavors towards policy change and implementation.

## **3. GENERAL OBJECTIVE**

The general aim of the research was to determine the knowledge and behavior of pregnant women in Uyo, Akwa Ibom State towards tetanus toxoid immunization.

## **4. SPECIFIC OBJECTIVE**

- To determine the level of knowledge of pregnant women concerning tetanus and tetanus toxoid immunization in Uyo.
- To assess the behavior of pregnant women in Uyo towards tetanus toxoid immunization as measured by their attitudes and practice.
- To deduce any association between tetanus toxoid uptake and some socio-demographic variables.

## **5. SCOPE OF STUDY**

This study is limited to consenting pregnant women who attended the ante-natal clinics in Uyo irrespective of age, marital status, qualification and occupation.

## **6. MATERIALS AND METHODS**

### **6.1 Study Area**

Uyo is the capital and largest city in Akwa Ibom state, located in South-south Nigeria. It is an urban city with various institutions (both public and private) providing healthcare at different levels [13]. Obstetric care is mainly practiced at secondary and tertiary levels. For the purpose of this study, two health facilities were selected in Uyo Metropolis based on known high patronage for maternity services especially antenatal attendance and delivery rate and the need for better population spread. The antenatal clinics of the University of Uyo Teaching Hospital (UUTH), a tertiary health care facility and that of St. Luke's Hospital, Anua (SLHA), a secondary health institution were chosen.

### **6.2 Design**

A descriptive cross sectional study was used to assess the knowledge and behavior of antenatal attendees in Uyo metropolis towards tetanus toxoid immunization.

### **6.3 Study Population**

A descriptive cross sectional study was used to assess the knowledge and behavior of antenatal attendees in Uyo metropolis towards tetanus toxoid immunization.

#### 6.4 Study Design

The minimum sample size for this study was 252. This was determined using a previous study in Port Harcourt, Nigeria in 2015 where 18.2% (93 of the 512) respondents knew that the complete number of doses of TT needed for lifelong immunity was 5 [14]. The Fischer's formula for qualitative variables below was used to determine the minimum sample size for the study [15]:

Fisher's formula:  $n = z^2pq/d^2$

Where: n = minimum sampling size, z = standard normal deviate, usually constant given as 1.96

p = prevalence of the factor from previous study ( $p = 18.2\%$ ,  $(18.2)/(100) = 0.182$ )

q = probability of something not happening (given as  $1 - p$ ,  $1 - 0.182$ ,  $q = 0.818$ ); and d = degree of precision was (given as 0.052)

By substitution,  $n = 1.962 (0.182 \times 0.818) = 3.8416 \times 0.1489 = 228.8$  plus 10% Attrition rate = 252

0.052                      0.0025

Therefore, the minimum sample size of 252 was used for the study

#### 6.5 Sampling Technique

A simple random sampling technique was used to recruit 252 Antenatal attendees as respondents into the study comprising 134 from the University of Uyo Teaching Hospital and 118 from St Luke's Hospital Anua between 1st January and 28th February, 2017. The distribution ratio between the chosen hospitals was based on the ratio of total deliveries in the two hospitals at the end of the preceding year, 2016. After introducing the study during the health talk, 'Yes' and 'No' responses were written on pieces of papers and every pregnant woman attending antenatal clinic in each of the two chosen health facilities selected in Uyo Metropolis was given a chance to ballot on their clinic days. The questionnaires were administered to those who picked "Yes" until the measured sample size was obtained for each center. Those who picked 'Yes' but declined to participate in the study were excluded.

#### 6.6 Study Instrument

Data for this study were collected using the questionnaire. The questionnaire was structured with closed-ended and some open-ended questions. It was developed based on the study objectives. There was a consent form attached to each questionnaire and it was divided into four sections: section A, which contained socio-demographic and obstetric characteristics of the participants with 7 items; section B also had 7 items and enquired about the level of knowledge of respondents about tetanus/tetanus toxoid immunization. Sections C and D assessed the respondents Behavior towards tetanus toxoid immunisation, and focused on their attitudes using the Likert scale and practices respectively. To ensure the validity and reliability of the questionnaire, it was pre-tested with 10 pregnant women in another health institution different from the study centers.

The questionnaire was a self-completed by each respondent with guidance provided where necessary by the trained research Assistants who distributed the questionnaires and collected them following completion. The completed questionnaires were immediately screened and poorly or wrongly filled ones discarded and replaced by an extension of the balloting process and completion of more questionnaires until the desired sample size for the center is attained.

#### 6.7 Method of Analysis

Data generated from this research were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 22.0 software. Mean and standard deviations were calculated for continuous variables. Categorical variables were presented in frequencies and percentages. Chi square test was used to determine the association between socio-demographic characteristics of respondents and their practice of tetanus toxoid immunization, and P-values less than 0.05 were considered statistically significant.

#### 6.8 Ethical Clearance

Ethical clearance for this work was obtained from the Ethical Committee of the University of Uyo Teaching Hospital, Uyo through the Co-coordinator of Community Health Officers' Training School of the Hospital. Letters were sent to the Officers-in-charge of the selected ante-natal clinics for permission to conduct research using their clients. The Administrators of the hospitals were duly copied.

The respondents were assured that the information contained in the questionnaire were strictly confidential and were needed only for the purposes of research.

A consent form was presented to each respondent to sign to signify voluntary participation following explanation of the purpose of the research to them. The participants were also informed of their freedom to withdraw from the study at any time in the course of completing the questionnaire if they so desire.

#### 6.9 Limitation of Study

Information on practice of tetanus toxoid immunization was subjective based strictly on reports provided by the pregnant women involved in the study. Such information is reliable to the extent the respondents can remember and respond, and their willingness to be sincere and state the truth.

## 7. RESULTS

The majority (90.5%) of respondents were less than 35 years. The mean age was 26.75 years with a standard deviation of 5.16. Most (41.7%) were civil servants. Almost half the respondents (49.2%) had completed secondary education. A greater proportion (94% and 96.4%) were married and Christians respectively.

**Table 1:** Socio-demographic and clinical characteristics of Respondents

Characteristics	Frequency	Percentage
<b>Age Group (in years)</b>		
Less than 35 years	228	90.5
35 years and above	24	9.5
<b>Mean age 26.75 SD 5.16</b>	<b>(Range 15-51)</b>	
<b>Occupation</b>		
Civil servant/public servant	105	41.7
Housewife	51	20.2
Student/unemployed	33	13.1
Hair dresser/seamstress	32	12.7
Business Women	22	8.7
Accounting/Banking	4	1.6
Health worker/Nurse	3	1.2
Farmer	2	0.8
<b>Level of education</b>		
No formal education	7	2.8
Primary	19	7.5
Secondary	124	49.2
Post-secondary	102	40.5
<b>Marital Status</b>		
Married	237	94.0
Never Married	10	4.0
Separated/Divorced	3	1.3
Widowed	2	0.8
<b>Religion</b>		
Christianity	243	96.4
Islam	8	3.2
Traditional worshipper	1	0.4
<b>Total</b>	<b>252</b>	<b>100</b>

Greater proportions (38.9%) had been pregnant twice with approximately 80% being multigravidas.. Most (38.9%) had 2 previous deliveries with 70% having 2 or more children. Only about 20% were prim gravidas, while 7.5% and 21.4% were nulliparae and primiparae respectively.

**Table 2:** Project selection matrix rules

Characteristics	Frequency	Percentage
<b>No. of times Pregnant</b>		
1	51	20.3
2	98	38.9
3	53	21.0
4	35	13.9
5	6	2.4
6	8	3.2
7	1	0.4
<b>No. of Deliveries</b>		
None	19	7.5
1	54	21.4
2	100	38.7
3	44	17.5
4	26	10.3
5	4	1.6
6	5	2.0

The majority of respondents, 247(98.1%) had heard about Tetanus infection (Not shown on Tables of Results), while 97.2% knew of the existence of tetanus toxoid vaccine. Health workers 213 (85.9%) were the first and commonest source

of information about TT. The majority 228(90.5%) knew that TT was for prevention. Most 200(80.0%) knew TT prevents tetanus infection in children while only 28(11.2%) knew it can prevent tetanus infection in mothers. A greater proportion of respondents, 91(36.4%) knew that all women should receive TT while 85 (34.0%) felt that it should be for all women of child bearing age. Only about one-third, 80 (31.7%) of respondents knew that 5 doses of TT confers life-long prevention against tetanus.

**Table 3:** Respondents ‘Awareness of Tetanus Toxoid

Characteristics	Frequency	Percentage
<b>Heard of TT</b>		
Yes	245	97.2
No	7	2.8
<b>First source of information on TT</b>		
News media	6	2.4
Posters/brochures	8	3.2
Health workers/ante natal clinic	213	85.9
Family and friends	8	3.2
Religious leaders	7	2.8
Teachers at school	6	2.4
<b>The aim of TT Immunization</b>		
Treatment	6	2.4
Prevention	228	90.5
Preservation	6	2.4
Don't Know	10	4.0
Others	1	0.4
<b>Disease condition prevented by TT</b>		
None	3	1.2
Tetanus infection in adults	11	4.4
Tetanus infection in new-born	200	80.0
Tetanus infection among pregnant mothers	28	11.2
Diseases other than tetanus	1	0.4
Don't know	7	2.8
Others	2	0.8

The majority had a positive attitude towards the use of tetanus toxoid with more than 80% strongly agreeing that women should be routinely immunized against tetanus, should aim to complete same and should receive regular courses on the need for such. They also feel strongly that the vaccine is safe in pregnancy while disagreeing that it was expensive.

**Table 4:** Respondents ‘Awareness of Tetanus Toxoid

Variable	Strongly Agree	Agree	Indifferent	Disagree	Strongly Disagree
Adults should be routinely immunized against tetanus	203(80.6)	33(13.1)	11(4.4)	4 (1.6)	2 (0.8)
Regular seminar/refresher courses regarding immunization are needed	202(80.2)	43(17.1)	3 (1.2)	2 (0.8)	2 (0.8)
Tetanus toxoid immunization is the responsibility of all health workers	164(65.1)	69(28.1)	8 (3.2)	7 (2.8)	4 (1.6)
Tetanus toxoid is safe for mother and baby and should be encouraged	194(77.0)	52(20.6)	0(0)	6(2.4)	0(0.0)
Regular refresher courses can assist in updating knowledge on adults immunization and should be encouraged	68( 27.0)	162(64.3)	4 (1.6)	10(4.0)	8(3.2)
TT in pregnancy cause miscarriage and congenital abnormalities and should be discouraged	8 (3.2)	5(2.0)	12(4.8)	136 (54.0)	91(36.1)
Tetanus toxoid is very expensive and scarce	19(7.5)	9(3.6)	5 (2.0)	75(29.8)	145(57.5)

Most of the women 236 (93.7%) had received at least 1dose of TT; while 123(52.1%) got up to 5 doses. However 184(78%) claimed they had completed the immunization schedule. A greater percentage 216 (85.7%) will encourage other women to receive TT, even as 214 (84.9%) had been fully educated on the advantages of TT. The commonest reason some had not received it was that it was not offered to them (31.3%).

**Table 5:** Respondents` Behaviour (Practice) towards Tetanus Toxoids Immunisation

Tetanus Toxoid characteristics	Frequency	Percentage
<b>Ever received TT</b>		
Yes	236	93.7
No	16	6.3
<b>No of times TT received (n=236)</b>		
1	10	4.2
2	20	8.4
3	12	5.1
4	58	24.6
5	123	52.1
Don't know	13	5.5
<b>Completed TT immunization schedule ( n=236)</b>		
Yes	184	78.0
No	49	20.8
Don't Know	3	1.3
<b>Encouraged other women to get TT</b>		
Yes	216	85.7
No	36	14.3
<b>Reasons for not receiving TT during pregnancy(n=16)</b>		
Was not offered to me	5	31.3
Declined for fear of side effects	3	18.8
Is expensive	2	12.5
Haven't just decided	3	18.8
Injection site may be painful	1	6.3
Other reasons	2	12.5
<b>Ever been fully educated on advantages of TT immunization</b>		
Yes	214	84.9
No Don't	26	10.3
Know	12	4.7

There was a statistically significant association between level of education of respondents and getting Tetanus toxoid immunization. More of those with higher level of education received tetanus toxoid ( $p=0.001$ ). The Respondents age was not significantly associated with her being immunized against Tetanus toxoid.

**Table 6:** Respondents` Behaviour (Practice) towards Tetanus Toxoids Immunisation

Factors	Ever Received Tetanus Toxoid Immunization		Total	Statistical test and their values
	Yes n (%)	No n (%)		
<b>Level of education</b>				$X^2=16.786$ $P=0.001^*$ $Df= 3$
No formal education	6(85.7)	1 (14.3)	7	
Primary Education	14(73.7)	5 (26.3)	19	
Secondary education	116(93.5)	8 (6.5)	124	
Post-secondary	100(98.0)	2 (2.0)	102	
<b>Age group (years)</b>				$X^2=0.213$ $P=0.999$ $Df= 1$
Less than 35	213 (93.4)	15 (6.6)	228	
35 years and above	23 (95.8)	1 (4.2)	24	

## 8. DISCUSSION

The majority of the respondents in our study were aware of the existence of tetanus infection and tetanus toxoid vaccine, which is in accordance with findings in previous studies [14, 16, 17]. While the educational status of the participants may play a role in these knowledge as found by earlier researchers [16,18], parity may be a strong factor as majority (about 80%) of our Respondents were multiparous and the primary source of information was from health workers/antenatal clinics. It could thus be reasoned that higher parity increases contact with health care workers through antenatal clinic attendance and antenatal health talk.

It was revealing to note that most of respondents knew tetanus toxoid immunization was for prevention (90%) of tetanus infection especially in the newborn (80%). Previous studies also noted this high knowledge of the purpose of tetanus toxoid immunization [14, 17]. This may also be a product of both high level of education among our clients and information obtained during past and the current antenatal clinic attendance as they were mostly multiparous. An earlier study among

women in Jos North regarding immunization had shown that the level of education was significantly associated with how knowledgeable mothers were on immunisation and vaccine preventable diseases with higher levels of education being associated with higher knowledge [14]. A high level of knowledge about tetanus toxoid immunisation was also found in earlier studies among female undergraduates in South-south Nigeria and India [14, 19]. Despite the high level of awareness demonstrated by the participants in our study, only a third of the respondents knew that tetanus toxoid vaccine was targeted at any woman of child bearing age which was similar to that in the study by Alex-Hart et-al. [14]. While 36.4% of the respondents thought it was for all women, 24.4% had the misconception that it was for only pregnant women. This level of misconception is not surprising as most women are only exposed to both the information about the disease and the tetanus toxoid administration from health care information obtained during antenatal clinics.

It was surprising to note that about one third of the population studied (31.7%) knew that the complete dose for tetanus toxoid is 5doses and that it confers life-long immunity. Although this is higher than those of previous studies by Sule et-al and Alex-Hart et-al in Nigeria and Abas in Kabala city who all found less than 20% of their study population being aware that 5 doses were necessary for life time coverage [14, 20, 21]. It further exposed the low level of knowledge of the tetanus toxoid vaccination programme and rather high level of misconception about the target population despite the high level of educational qualification and the study area being Urban. These misconceptions further buttress the previously reported poor uptake of vaccine by women of child bearing age in Nigeria [11].

There was a global positive attitude towards tetanus toxoid immunization among the studied population. This may be a reflection of their knowledge of both the disease and the vaccine through information obtained from health workers especially in antenatal clinics.

Despite the low immunization coverage in Nigeria [11,22], our study revealed that 93.7% of the respondents had received at least one dose of TT while 52.1% had received 5doses thus indicating a reduced drop-out rate compared to a similar study in Niger Delta region that revealed a high drop-out rate [18]. However, it could not be established if the 5 doses received by the majority of our respondents translated to a completion of the immunization schedule or a product of failure to follow schedules postpartum and initiation of fresh dosing at each pregnancy. This is significant as short inter-pregnancy intervals may warrant women taking multiple albeit incorrectly scheduled doses of tetanus toxoid vaccine.

It is noteworthy that whereas only half of the studied population had received up to 5 doses of tetanus toxoid, the claim for completeness of the schedule was 78%. The impossibility in this is a manifestation of the misconception and understanding of what constituted completeness based the WHO recommendation by our respondents. It is also possible that completeness of the total requirement for the scheduled time may have been interpreted to mean completing the dose needed at the time of interview based on the index pregnancy. The common finding in Nigeria is that a significant number of women received TT2 [10, 11]. The reason for this disparity may have been due to differences in the population studied. An assessment of tetanus toxoid vaccination awareness and uptake among women of reproductive age in kwara state Nigeria showed both poor knowledge and uptake which was 0% for both TT4 and TT5 [23]. Other studies in South-south region by Enuke CA et-al and Maduiké G et-al similarly revealed that none of the women interviewed by them had completed the 5 doses recommended by WHO [18,24], while Alex-Hart reported only 2% of all the respondents had completed [14]. This is a reflection of the poor knowledge of the TT vaccination program. Similar studies in other developing countries also reported a very poor TT5 vaccination coverage [16, 19].

This study revealed that our region alongside others sea in the country especially Southeast and Southwest, Nigeria have made significant impact at eliminating maternal and neonatal tetanus considering the coverage vis-a-vis the Northern parts of Nigeria [11,25]. This was similar to findings in other studies where high awareness and knowledge translated to high usage [26, 27].

Furthermore, the majority of our respondents admitted to have been fully educated on the advantages of TT immunization and will encourage other women of child bearing age to receive the immunization. This may be products of the high level of educational attainment, the urban study location and the Christian religious background of participants which had been shown to positively influence uptake in Nigeria [14]. The possible contribution of health education during previous antenatal clinics as evidenced by their parity cannot be ignored.

The major reason given by the few that never received TT vaccination was lack of awareness followed by fear of side effects and indecision. This is in agreement with similar studies in the Niger Delta region. [18, 28], and a clear show of ignorance.

The study showed a positive correlation between tetanus toxoid immunization uptake and being educated. This may be a function of their knowledge of the vaccine as found in this study and others [16, 28]. While age and educational status were positive predictors for tetanus toxoid uptake in some studies, one study showed an inverse relationship between protective immunity for tetanus and increasing maternal age [29, 30]. The differences in findings may be a function of the variation in the studied population characteristics and differences in study designs.

In conclusion, the study showed a fairly good awareness of tetanus infection, the protection offered by tetanus toxoid

vaccination as well as a good disposition that is unmatched by practice. There is a misconception in understanding of what constituted completeness of the WHO recommendation and receiving 5 doses of tetanus toxoid. There is therefore the need for proper health education to improve awareness of the vaccine especially the number of doses, intervals/ schedules, the protection offered and what and when tetanus toxoid immunization is considered complete and lifetime immunity achieved. There is the need for the evaluation of the content of health enlightenment information provided by Health personnel to mothers attending ANC in Nigeria. Any inadequacy or misconceptions noted here could form the basis for organization of update courses for this category of hospital staff.

## 9. CONFLICT OF INTEREST AND FUNDING

There were no potential conflicts of interest and no financial support for this research, authorship, and/or publication of this article.

## 10. ACKNOWLEDGEMENT

The authors acknowledge with gratitude the students of Community Health Officers Training school (CHOTS), University of Uyo Teaching Hospital, Uyo who were the research assistants and the women who participated in the study.

## 11. REFERENCES

- [1] Khan R, Vandelaer J, Yakubu A, Raza A A, and Zulu F, "Maternal and neonatal tetanus elimination: from protecting women and newborns to protecting all. A review.," *International journal of women`s health*, vol. 7, no. 1, pp. 171-180, 2015.
- [2] Roper M H, Vandelaer J, and Gasse F, "Maternal and neonatal tetanus," *Lancet* , vol. 370, pp. 1947-1959, 2007.
- [3] Blum FC, Chen C, Kroken A R, and Barbieri J T, "Tetaus toxin and botulinum toxin A utilize Unique mechanisms to enter neurons of the central nervous system," *Infect. Immune*, vol. 80, pp. 1662-1669, 2012.
- [4] Hassel B, "Tetanus: Pathophysiology, treatment, and the possibility of using Botulinum toxin against Tetanus induced rigidity and spasms," *Toxins*, vol. 5, pp. 5:73-83, 2013.. [Online]. [www.mdpi.com/journal/toxins/doi:10.3390/toxins5010073](http://www.mdpi.com/journal/toxins/doi:10.3390/toxins5010073)
- [5] William Atkinson MJ H. (2016, March) Docshare. [Online]. [http://docshare.tips/epidemiology-and-prevention-of-vaccine-preventable-diseases\\_5787ce83b6d87f222e8b489c.html](http://docshare.tips/epidemiology-and-prevention-of-vaccine-preventable-diseases_5787ce83b6d87f222e8b489c.html)
- [6] Bleck T P, *Clostridium tetani(Tetanus): In Principles and Practice of infectious diseases*, 6th ed., Mandell L G, Bennett E J, and Dolin R, Eds. Amsterdam, The Netherlands: Elsevier, 2005.
- [7] Kyu H H et al., "Mortality from tetanus between 1990 and 2015: findings from the Global Burden of Disease study 2015," *BMC Public Health*, vol. 17, no. 1, p. 179, 2017. [Online]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5299674/#>
- [8] WHO. (2015, May) Maternal and Neonatal Tetanus(MNT) elimination. The initiative and challenges. [Online]. [http://www.who.int/immunization/diseases/MNTE\\_initiative/en/](http://www.who.int/immunization/diseases/MNTE_initiative/en/)
- [9] Darmstadt G L et al., "Evidence-based, cost-effective interventions: how many newborn babies can we save?," *Lancet*, vol. 365, pp. 977–988, 2005.
- [10] World Health Organization. (2014, May) Second and subsequent doses of tetanus toxoid: reported estimates of TT2+ coverage. [Online]. [http://apps.who.int/immunization\\_monitoring/globalsummary/timeseries/tscoveraget2plus.html](http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tscoveraget2plus.html).
- [11] National Population Commission (NPC) [Nigeria] and ICF International, "Nigeria Demographic and Health Survey 2013," in *NPC and ICF International*, Abuja, Nigeria, and Rockville, Maryland, USA, 2014.



- [12] Jalal-Eddeen Abubakar Saleh and Khaled Abdelrahim, "Towards Elimination of Maternal and Neonatal Tetanus in the Developing Countries: A Look at the Theory of Planned Behaviour," *European Journal of Preventive Medicine*, vol. 3, no. 4, pp. 110-116, 2015.
- [13] Nigeria Galleria. Prominent Towns in Akwa-Ibom. [Online]. [http://www.nigeriagalleria.com/Nigeria/States\\_Nigeria/Akwa-Ibom/History-of-Uyo-in-Akwa-Ibom-State.html](http://www.nigeriagalleria.com/Nigeria/States_Nigeria/Akwa-Ibom/History-of-Uyo-in-Akwa-Ibom-State.html)
- [14] Alex-Hart B A and Okon BA N, "Awareness and status of Tetanus Toxoid Vaccination among female undergraduate students in a Nigerian University," *Int. J Trop. Dis Health*, vol. 7, no. 1, pp. 6-15, 2015.
- [15] Charan J and Biswas T, "How to calculate sample size for different study designs in medical research?," *Indian J Psychol Med*, vol. 35, no. 2, pp. 121-6, 2013. [Online]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3775042>
- [16] Qadir M et al., "Frequency of tetanus toxoid immunization among college and University female students of Karachi," *J Ayub med coll Abbottabad*, vol. 22, no. 1, pp. 147-9, 2010.
- [17] Chris-Otubor G O, Dangiwa D A, Lor L D, and Anukam N C, "Assessment of knowledge, Attitude and practices of mothers in Jos North Regarding immunization," *IOSR Journal of Pharmacy*, vol. 5, no. 6, pp. 34-45, June 2015.
- [18] Madubuike G, Asuquo E O, and Oriji V K, "Tetanus toxoid immunization, Drop - out Rates and determining factors among women in Niger- Delta community," *Nigeria. International Journal of public Health Research*, vol. 6, no. 2, pp. 20-25, 2018.
- [19] Basher M S, "Knowledge and practice about TT vaccination among undergraduate medical students," *Mymensingh Med J*, vol. 19, no. 4, pp. 520-523, 2010.
- [20] Sule S S, Nkem-Uchendu C, Onajole A T, and Ogunowo B E, "Awareness, Perception and coverage of TT immunization in women of child bearing age in an Urban district of Lagos, Nigeria," *Niger Postgrad Med J*, vol. 21, no. 2, pp. 107-24, 2014.
- [21] Seger H R and Abbas I M, "Assessment of Pregnant Women's Knowledge about Tetanus Toxoid Vaccination in Karbala City," *Iraqi National Journal of Nursing specialties*, vol. 27, no. 1, pp. 23-31, 2014.
- [22] UNICEF. (2018, October) MNT- Endemic Countries. [Online]. <http://www.unicefusa.org/mission/survival/immunization/tetanus/endemic-countries>
- [23] Bello A D and Aduroja P E, "Assessment of tetanus toxoid vaccination and uptake among women of reproductive age in Kwara state, Nigeria," *JOCAMR*, vol. 4, no. 2, pp. 1-10, 2017. [Online]. [https://www.researchgate.net/publication/321031508\\_Assessment\\_of\\_Tetanus\\_Toxoid\\_Vaccination\\_Awareness\\_and\\_Uptake\\_among\\_Women\\_of\\_Reproductive\\_Age\\_in\\_Kwara\\_StateNigeria](https://www.researchgate.net/publication/321031508_Assessment_of_Tetanus_Toxoid_Vaccination_Awareness_and_Uptake_among_Women_of_Reproductive_Age_in_Kwara_StateNigeria)
- [24] Enuke C A and Orru O, "Awareness of tetanus toxoid vaccination by pregnant women attending antenatal clinic in central hospital, Benin City," *Journal of science and practice of Pharmacy*, vol. 3, no. 1, pp. 92-96, December 2016. [Online]. <http://www.jsppharm.org>.
- [25] WHO. Immunization, vaccines and biologicals: vaccines and diseases - maternal and neonatal tetanus elimination (MNTE). [Online]. [http://www.who.int/immunization/diseases/MNTE\\_initiative/en/](http://www.who.int/immunization/diseases/MNTE_initiative/en/)
- [26] Onale R, Mshelia H, William I, and Ogala N, "Prevalence and outcome of Neonatal Tetanus in Zaria, North West, Nigeria," *J infest Dev Countries*, vol. 5, no. 4, pp. 225-39, 2011.
- [27] Martin A, Mensah A, Frimpong F, Aboagye E, and Acheampong N, "Immunization Coverage of pregnant Woman With Tetanus Toxoid Vaccine in Dormant East District- Bring Adaro Region, Ghana," vol. 4, no. 6, pp. 47-55, 2014.
- [28] Madubuike G, Asuquo E O, and Oriji V, "Perception of tetanus toxoid immunization among women in a Niger Delta community, Nigeria," *International Journal of tropical disease and Health*, vol. 23, no. 3, pp. 1-8, June 2017.

- [29] Orimadegun A E, Adepoju A A, and Akinyinka O O, "Prevalence and socio-demographic factors associated with non-protective immunity against tetanus among high school adolescents girls in Nigeria," *Ital J Pediatr*, vol. 40, no. 1, p. 29, March 2014. [Online]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3995425/>
- [30] Shafiq Y et al., "Knowledge, attitudes and practices related to tetanus toxoid vaccination in women of childbearing age: A cross-sectional study in peri-urban settlements of Karachi, Pakistan," *J Infect Prev*, vol. 18, no. 5, pp. 232-241, 2017.