



EVALUATION OF COMPLIANCE WITH TETANUS TOXOID VACCINATION AMONG PERSONS AT RISK IN WARRI, DELTA STATE, NIGERIA

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ABSTRACT

Background: Tetanus remains prevalent in many developing countries possibly due to the fact that the vaccine is often taken haphazardly without regard to guideline recommendations. **Objectives:** To evaluate level of awareness and compliance with the recommended tetanus vaccine schedule among occupationally exposed persons and pregnant women. **Methods:** A pretested self-administered questionnaire with Chronbach's alpha coefficient value of 0.62 was administered to 250 artisans and 150 pregnant women. The questionnaire explored knowledge of benefits of the vaccine and respondents' compliance with recommended schedules. Descriptive statistics was performed. Data was expressed as frequencies and percentages. **Results:** The level of awareness and exposure to tetanus vaccine was quite high, 206 (85.5%). However, uptake was suboptimal, 147 (61%). More than half, 158 (65.5%) took the vaccine haphazardly. There was a progressive decrease in rates of uptake of subsequent doses of the vaccine, 57 (23.7%), 25 (10.4%) and 12 (4.98) for start dose, second dose and 3rd dose respectively. The proportion of persons that expressed uncertainty about their tetanus vaccination status was very high, ranging from 44.8% to 78%. Uptake of the vaccine was better among pregnant women than artisans. Rate of booster dose uptake among pregnant was low, 9 (9.68%). **Conclusion:** Uptake of the tetanus vaccine was suboptimal. Rates of default increased with subsequent doses of the vaccine. Awareness and uptake of the vaccine was higher among pregnant women compared to artisans. The proportion of persons with uncertain vaccination status was high.

KEYWORDS: Tetanus toxoid, Vaccination, Compliance, Adherence, Nigeria.

INTRODUCTION

Tetanus remains significantly prevalent in many developing countries and mortality is high.^[1-5] In many settings, the vaccine is administered without recourse to immunization history in the mistaken belief that the start dose confers adequate protection.^[6-7] For adults and pregnant women, adherence to the recommended immunization schedule including booster doses, confers lifelong immunity and protection.^[8-10] Studies relating to uptake of tetanus toxoid have focused mostly on pregnant women.^[11-14] There is a need to explore knowledge and adherence among other groups of persons at risk of tetanus infection due to occupational exposure and other factors..

OBJECTIVE

To determine the level of awareness and exposure to tetanus toxoid vaccination among occupationally exposed persons (welders, carpenters, iron workers, other artisans) and pregnant women and to evaluate level of compliance with the recommended vaccination schedule.

MATERIALS AND METHODS

Study Design

The study was a cross sectional descriptive survey carried out in three Local Government Areas (LGA) of Delta State, Nigeria.

Study Setting

This study was carried out in Delta State, Nigeria. The state is located in the Niger Delta region of the South-South geopolitical zone of the country, with an estimated size of 762 km² and a population of 4,098,291.^[15] The state is made up of 25 local government areas. Medical services are offered by a Teaching Hospital, Federal Medical Centers and Central Hospitals located in different parts of the state. The LGA is responsible for primary health care while the Ministry of health is responsible for secondary and tertiary health care, as well as disease control activities in the state. Vaccines are primarily distributed by the National Primary Health Care Agency (NPHCA) through a downward cascade involving the National cold store, State cold store, Local Government Area cold stores and primary health centers.

Data Collection

A pretested self-administered twelve-item questionnaire with Chronbach's alpha coefficient value of 0.62 was used for the study. The questionnaire had 3 sections. Section A dealt with demographic data, Section B explored level of awareness and knowledge of tetanus toxoid vaccination among at risk groups while the last section addressed adherence to the recommended schedule. The questionnaires were administered to artisans who were present at their place of work at the time of the study. Respondents were informed of the objectives of the study and assured of confidentiality. Only those who indicated a willingness to participate in the study by signing a written informed consent form were recruited for the study. Clear instructions were given on how to fill the questionnaire.

Sample Size/Sampling technique

Sample size was calculated using Cochran's formula.^[16]
 $n = Z^2 pq/d^2$ therefore,
 $n = (1.96^2 \times 0.5 \times 0.5) \div 0.05^2$
 $n = 384.16$

The sample size obtained was rounded up to 400 to allow for attrition due to non-response. Three local government areas were randomly selected out of the 25. A purposive sampling technique was used to recruit 250 artisans from the artisan population in the LGAs and 150 pregnant women from antenatal clinics in primary health centers located in the LGAs.

Inclusion/ exclusion criteria

Artisans must be at their place of work at the time of study and only women who have had at least one pregnancy to full term were recruited.

Artisans who lacked evidence of being professionally active or whose work status could not be verified and women who had never been pregnant or who had never had a full term pregnancy were excluded from the study.

Data Analysis

Data collected were entered into Microsoft Excel, rechecked for accuracy and loaded into the Statistical Package for Social Sciences (SPSS) software (version 17.0),^[17] for descriptive statistical analysis.

Ethical Approval

Ethical approval was obtained from the Health and Ethics Research Committee, Delta State Ministry of Health. Ethical Permit no HREC/ MOH 21 / 13/ 0088.

RESULTS

Two hundred and forty one (241) questionnaires were retrieved out of the 400 administered giving a response rate of 60.3%. The predominant age group was 31 to 40 years (35.3%). Pregnant women were 93 (38.6%). Almost half, 105 (43.6%) of respondents were married, Table 1.

Although the level of awareness about tetanus vaccination was quite high, 206(85.5%), uptake was suboptimal, 147 (61%). Also knowledge of the preferred site of administration was poor as only 22 (9.1%) correctly identified the deltoid muscle as the proper site. Administration of the vaccine was mainly done in health care facilities with less than one quarter 52 (21%) administered in pharmacies, Table 2.

A progressive decrease in rates of uptake of subsequent doses of the vaccine was noticed in this population as nearly one quarter, 57 (23.7%), 25 (10.4%) and 12 (4.98) admitted taking the start dose, second dose and 3rd dose respectively. The proportion of persons that expressed uncertainty about their tetanus vaccination status was very high ranging from 44.8% to 78%, Table 3.

Even though a similar trend of progressive default with successive doses of toxoid was noticed among pregnant women, knowledge and uptake of the vaccine was better than that of artisans, Nearly three quarters, 71 (76.3%) recall having had a tetanus toxoid shot during pregnancy and 68 (73.2%) correctly answered that just one dose of the vaccine does not confer adequate immune protection. The proportion of booster dose uptake was very low among pregnant women, 9 (9.68%), Tables 4 & 5.

Table Legends

Table 1

Although there are numerous classes of artisans, the groups included in occupation category of the social demographics are those at risk of deep puncture wounds by virtue of working with nails or other metal objects

Table 2

Chemist refers to registered pharmaceutical premises.

Table 3

The primary series of tetanus toxoid injection consists of three shots at start (no immunity) 4-8 weeks, and 6-12 months which confers immunity for 10 years. A booster dose every 10 years thereafter ensues lifelong protection

Table 4

This schedule is incorporated into the National immunization program. The first dose is taken when a pregnant woman first comes in contact with the health system

Table 5

This is specifically for pregnant women.

Table 1: Demographic characteristics of respondents. n=241

Characteristic	N (%)
Sex	
Male	148(61.4)
Female	93(38.6)
Age group	
20-30	70(29.0)
31-40	85(35.3)
41-50	9(3.3)
51-60	48(19.9)
Above 60	30(12.5)
Marital Status	
Single	98(40.7)
Married	125(51.9)
Widow	18(7.5)
Education	
Primary	22 (9.1)
Secondary	136(56.4)
Tertiary	83(34.4)
Occupation	
Welder/Iron bender	86 (35.7)
Furniture makers	62(25.7)
House wife	93 (38.6)

Table 2: Awareness and exposure to Tetanus toxoid vaccine. n=241

Item		N (%)
Ever heard of tetanus toxoid (TT) vaccination?	Yes	206(85.5)
Have you ever received a shot of toxoid (TT) vaccination?	Yes	147(61.0)
	No	57(23.7)
	Don't know	37(15.4)
From which facility did you receive toxoid (TT) vaccination?	General hospital	57(23.7)
	Primary health center	38(15.8)
	Chemist	52(21.6)
	Not applicable	94(39.0)
Where should TT shot should be given?	Buttock	162(67.2)
	Upper arm	22(9.1)
	I don't know	57(23.7)
I take TT only when I have injury	158(65.5)	

Table 3: Compliance with the primary series of Tetanus toxoid injections. n = 241

Dose	Yes	No	Not sure
1 st dose (Start anytime)	57 (23.7)	76 (31.5)	108(44.8)
2 nd dose (4-8 weeks later)	25(10.4)	50(20.7)	166 (68.9)
3 rd dose (6-12 months later)	12(4.98)	51 (21.16)	178(73.9)
Booster dose every 10 years	25 (10.4)	28 (11.6)	188 (78.0)

Table 4: Uptake of tetanus toxoid vaccine among women of child bearing age. n=93

Dose	Yes	No	Not sure	Don't know
1 st dose	62 (66.7)	9 (9.68)	19 (20.4)	7 (0.8)
After 4 weeks	55 (59.2)	9(9.7)	12 (12.9)	17 (18.3)
After 6 months	48 (51.6)	6 (6.5)	18 (19.4)	21 (22.6)
After one year	30 (32.3)	18 (19.4)	22 (23.7)	23 (24.8)
After 9 years	9 (9.68)	52(55.9)	28(30.1)	4 (4.3)

Table 5: Knowledge and use of tetanus toxoid among women of child bearing age. n=93

Variable	F (%)	
Ever had a shot during pregnancy?	Yes	71 (76.3)
	No	17(18.3)

	I don't Know	5(5.4)
Ever delivered without receiving TT shots?	Yes	17(18.3)
	No	51 (54.8))
	I don't know	25(26.9)
Did you know that a complete dose of TT vaccine received during pregnancy can confer protection for 10 years?	Yes	62(66.7)
Failure to complete the doses of TT after the first dose does not confer any immunity at all	True	68(73.2)
	False	25(26.8)

DISCUSSION

Despite significant progress in therapeutics, vaccine preventable diseases still exert a toll on the adult population.^[18] Between 2009 and 2017, the 20 to 60 years age group was the most affected by deaths from tetanus infection with deaths peaking among people aged 65 years and above.^[19] Vaccination uptake is therefore of utmost importance in order to reduce morbidity and mortality from vaccine preventable diseases.

The uptake of tetanus toxoid vaccine in this population was sub-optimal. Other studies have found similar low levels of uptake across age groups.^[20-24] Even though most of the tetanus toxoid vaccination was administered either at the hospital or primary health care center, a significant number of patients had their shots administered at the pharmacy. Pharmacy based vaccine administration is a global initiative adopted to increase vaccination uptake especially among the underserved population.^[25-26] At the peak of the COVID 19 pandemic, the US government established the Federal Retail Pharmacy Program. By the third quarter of 2021, nearly 150 million doses of COVID 19 vaccines have been administered by pharmacists through this initiative.^[27]

Anecdotal evidence suggest that the practice of taking tetanus toxoid vaccines at random without regard for recommended schedule for tetanus prophylaxis is widespread among adults in Nigeria. The findings from our study seems to corroborate this, as nearly three quarters of adults surveyed admitted taking Tetanus toxoid "only when I have injury" Other workers have also made similar observations.^[28-29] Adherence to recommended schedule is critical to ensuring adequate protection for those at risk and the attainment of herd immunity.^[30]

The fact that more than three quarters of respondents were not certain of their vaccination status is worrisome and emphasizes the need for proper vaccine administration record beyond routine records maintained at the primary health care center. Poor documentation of vaccination status has also been observed in studies conducted in Nigeria^[31-32] and other countries.^[33-34] Proper documentation has been shown to improve vaccine uptake. One study found a 21- fold increase in the likelihood of children with a health card being fully vaccinated compared to children without a health card (OR = 21.49, p.001).^[35] In our study women who have had children could better recall their tetanus vaccination

status. It has also been confirmed that multiparous women with documented history of tetanus toxoid vaccination were more likely to be more compliant with uptake of the vaccine.^[35-36] This indicates a need for documentation of vaccination to be extended to other at risk groups in order to improve vaccine uptake.

The major limitations of this study include the fact that a non- probability sampling method was used and vaccination status was mainly determined by respondents' recall which might be subject to bias.

CONCLUSION

The level of awareness about tetanus vaccine among the study population was quite high but uptake was suboptimal. A progressive decrease in rates of uptake of subsequent doses of the vaccine was noticed in this population. Awareness and uptake of the vaccine was better among pregnant women compared to artisans. The proportion of persons that expressed uncertainty about their tetanus vaccination status was very high ranging from 44.8% to 78%. It is important that educational interventions be implemented among populations at risk in order to ensure better rates of vaccine uptake and reduce morbidity and mortality from tetanus infection.

Conflict of interest

The authors have no conflicts of interest associated with the material presented in this paper.

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Author Contributions

Conceptualization and Design, data analysis, editing, review and final approval **AUD**; Data acquisition, curation, literature review, writing - original draft: **M J**; Methodology: **AUD, MJ**.

REFERENCES

1. Thysen SM, Benn CS, Gomes VF, Rudolf F, Wejse C, Roth A et al Neonatal BCG vaccination and child survival in TB-exposed and TB-unexposed children: a prospective cohort study. *BMJ Open.*, Feb 28,

- 2020; 10(2): e035595. doi: 10.1136/bmjopen-2019-035595.
2. Jensen, K. J., Biering-Sørensen, S., Ursing, J., Kofoed, P. E. L., Aaby, P., & Benn, C. S. Seasonal variation in the non-specific effects of BCG vaccination on neonatal mortality: Three randomised controlled trials in Guinea-Bissau. *BMJ Global Health*. 5(3). *BMJ Global Health*, 2020; 5: e001873.
 3. MacNeil A, Glaziou P, Sismanidis C, Maloney S, Floyd K. Global Epidemiology of Tuberculosis and Progress Toward Achieving Global Targets - 2017. *MMWR Morb Mortal Wkly Rep.*, Mar 22, 2019; 68(11): 263-266. doi: 10.15585/mmwr.mm6811a3.
 4. Adhikari N, Bhattarai RB, Basnet R, Joshi LR, Tinkari BS, Thapa A, et al. Prevalence and associated risk factors for tuberculosis among people living with HIV in Nepal. *PLoS ONE*, 2022; 17(1): e0262720. <https://doi.org/10.1371/journal.pone.0262720>
 5. Qaderi S, Qaderi F, Tarki FE, Shah J, Afaghi S, Delsoz M, Shah A. Generalized, non-neonatal tetanus is a highly fatal disease in Afghanistan: A case series study. *Int J Infect Dis.*, Feb, 2021; 103: 568-572. doi: 10.1016/j.ijid.2020.12.019.
 6. Kimani E, Muhula S, Kiptai T, Orwa J, Odero T, Gachuno O Factors influencing TB treatment interruption and treatment outcomes among patients in Kiambu County, 2016-2019. *PLoS ONE*, 2021; 16(4): e0248820. <https://doi.org/10.1371/journal.pone.0248820>
 7. Ogundare EO, Ajite AB, Adeniyi AT, Babatola AO, Taiwo AB, Fatunla OA, et al. A ten-year review of neonatal tetanus cases managed at a tertiary health facility in a resource poor setting: The trend, management challenges and outcome. *PLoS Negl Trop Dis.*, 2021; 15(12): e0010010. <https://doi.org/10.1371/journal.pntd.0010010>
 8. Kyu, H.H., Mumford, J.E., Stanaway, J.D. Barber R M, Hancock J R, 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**: 179. <https://doi.org/10.1186/s12889-017-4111-4>
 9. AAC (America Academy of Pediatrics) 2021 Immunizations. Available at <https://www.aap.org/en/patient-care/immunizations/> Accessed 22/3/22
 10. CDC (Centers for Disease Control and Prevention) 2019 **Vaccine (Shot) for Tetanus**. Available at <https://www.cdc.gov/vaccines/parents/diseases/tetanus.html>. Accessed 18/4/22
 11. Farias APV, da Silva TPR, Duarte CK, Mendes LL, Santos FBO, Matozinhos FP. Tetanus vaccination in pregnant women: a systematic review and meta-analysis of the global literature. *Public Health*, Jul, 2021; 196: 43-51. doi: 10.1016/j.puhe.2021.04.019.
 12. Gessesse, D.N., Yismaw, A.E., Yismaw, Y.E., & Workneh, T.W. Coverage and determinants of protective dose tetanus toxoid vaccine among postnatal women delivered at university of Gondar comprehensive specialized hospital, northwest Ethiopia, 2019. *Clinical Epidemiology and Global Health*, 2021; 12: 100814.
 13. Gebremedhin, Tsige & Welay, Fissaha & Mengesha, Meresa & Assefa, Natnael & Werid, Weldu. 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, Article ID 4023031, 8 pages <https://doi.org/10.1155/2020/4023031>
 14. Yaya S, Kota K, Buh A, Bishwajit G. Prevalence and predictors of taking tetanus toxoid vaccine in pregnancy: a cross-sectional study of 8,722 women in Sierra Leone. *BMC Public Health*, Jun 5, 2020; 20(1): 855. doi: 10.1186/s12889-020-08985-y. PMID: 32503478
 15. FRN (Federal Republic of Nigeria) Delta State. Official gazette, 2007; 24: 94.
 16. *Cochran*, W.G. Sampling Technique. 2nd Edition, John Wiley and Sons Inc., 1963, New York
 17. SPSS Inc. Released 2008. SPSS Statistics for Windows, Version 17.0. Chicago: SPSS Inc.
 18. Bizri AR, Althaqafi A, Kaabi N, Obeidat N, Al Akoury N, Haridy H. The Burden of Invasive Vaccine-Preventable Diseases in Adults in the Middle East and North Africa (MENA) Region. *Infect Dis Ther.*, Jun, 2021; 10(2): 663-685. doi: 10.1007/s40121-021-00420-y.
 19. CDC (Centers for Disease Control) Tetanus for clinicians Available at <https://www.cdc.gov/tetanus/clinicians.html>. Accessed 4/2/22
 20. Lu PJ, Hung MC, Srivastav A, Grohskopf LA, Kobayashi M, Harris AM et al Surveillance of Vaccination Coverage among Adult Populations - United States, 2018. *MMWR Surveill Summ*, May 14, 2021; 70(3): 1-26. doi: 10.15585/mmwr.ss7003a1.
 21. Oakley S, Bouchet J, Costello P, Parker J. Influenza vaccine uptake among at-risk adults (aged 16-64 years) in the UK: a retrospective database analysis. *BMC Public Health*, Sep 24, 2021; 21(1): 1734. doi: 10.1186/s12889-021-11736-2.
 22. Bhugra P, Grandhi GR, Mszar R, Satish P, Singh R, Blaha M et al Determinants of Influenza Vaccine Uptake in Patients With Cardiovascular Disease and Strategies for Improvement. *J Am Heart Assoc*, Aug 3, 2021; 10(15): e019671. doi: 10.1161/JAHA.120.019671.
 23. Haddison, E.C., Machingaidze, S., Wiysonge, C.S., Hussey, G.D., & Kagina, B.M. et al Mapping the evidence-base of adolescent and adult vaccination in Africa: A slow but growing trend. *Journal of Vaccines and Immunology*, 2019, 5(1): 011-017. DOI: 10.17352/jvi.000024
 24. Mihigo R, Okeibunor J, Masresha B, Mkanda P, Poy A, Zawaira F, Cabore J. Immunization And Vaccine Development: Progress towards High and Equitable

- Immunization Coverage in the Africa Region. *J Immunol Sci.*, Jul 2, 2018; 1: 1-9.
25. Pammal, R. S., Kreinces, J. B., & Pohlman, K. L. Importance of Pharmacy Partnerships in Effective COVID-19 Vaccine Distribution. *Disaster medicine and public health preparedness*, 8 Jun. 2021; 1-3. doi:10.1017/dmp.2021.178
26. Paudyal, V., Fialová, D., Henman, M. C., Hazen, A., Okuyan, B., Lutters, M., Cadogan, C., da Costa, F. A., Galfrascoli, E., Pudritz, Y. M., Rydant, S., & Acosta-Gómez, J. Pharmacists' involvement in COVID-19 vaccination across Europe: a situational analysis of current practice and policy. *International Journal of Clinical Pharmacy*, 2021; 43(4): 1139–1148. <https://doi.org/10.1007/s11096-021-01301-7>
27. CDC The Federal Retail Pharmacy Program For COVID 19 Vaccination, Available at <https://www.cdc.gov/vaccines/covid-19/retail-pharmacy-program/index.html>, Accessed 6/ 5/22
28. Sule SS, Nkem-Uchendu C, Onajole AT, Ogunowo BE. Awareness, perception and coverage of tetanus immunization in women of child bearing age in an urban district of Lagos, Nigeria. *Niger Postgrad Med J.*, Jun, 2014; 21(2): 107-14. PMID: 25126863.
29. Fatunde, O.J., & Familusi, J.B. Deficiencies in tetanus prophylaxis in wound management in Ibadan, Nigeria. *West African journal of medicine*, 2002; 21(2): 105-7.
30. Rhee P, Nunley MK, Demetriades D, Velmahos G, Doucet JJ. Tetanus and trauma: a review and recommendations. *J Trauma*, May, 2005; 58(5): 1082-8. doi: 10.1097/01.ta.0000162148.03280.02.
31. Oladoyi V O, Adebayo A M Community perspective of alternative methods of keeping immunization records in a rural setting of southwest Nigeria *Journal of community medicine and primary health care*, 2017; 29(2). <https://www.ajol.info/index.php/jcmphc/article/view/162451>
32. Akwataghibe NN, Ogunsola EA, Broerse JEW, Popoola OA, Agbo AI, Dieleman MA. Exploring Factors Influencing Immunization Utilization in Nigeria-A Mixed Methods Study. *Front Public Health*, 2019; 7: 392. Published 2019 Dec 20. doi:10.3389/fpubh.2019.00392
33. Lifson AR, Thai D, Hang K. Lack of immunization documentation in Minnesota refugees: challenges for refugee preventive health care. *J Immigr Health*, Jan, 2001; 3(1): 47-52. doi: 10.1023/A:1026662618911.
34. Maurer W, Seeber L, Rundblad G, Kochhar S, Trusko B, Kisler B et al Vienna Vaccine Safety Initiative. Standardization and simplification of vaccination records. *Expert Rev Vaccines*, Apr, 2014; 13(4): 545-59. doi: 10.1586/14760584.2014.892833.
35. Comfort Z. Olorunsaiye & Hannah Degge Variations in the Uptake of Routine Immunization in Nigeria: Examining Determinants of Inequitable Access, *Global Health Communication*, 2016, 2:1, 19-29, DOI: 10.1080/23762004.2016.1206780
36. 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 Erer District, Somali Regional State, Eastern Ethiopia. *Biomed Res Int.*, 2020; 4023031. doi: 10.1155/2020/4023031.