Prevalence of Neonatal Tetanus in Northeastern Nigeria

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Abstract
Background: Neonatal tetanus (NNT), a deadly vaccine preventable disease and one of the most underreported diseases in the developing countries, is seen in the newborn within the first 28 days of life. NNT remains one of the leading causes of deaths among neonates in the developing countries with about 130,000 neonatal deaths recorded in 2004. In the 1989 World Health Assembly and the 1990 world summit for children, WHO/UNICEF together with partner agencies called for the elimination of tetanus by 1995. Despite the global success recorded in the NNT elimination strategy, Nigeria is still among the 25 remaining countries that are yet to achieve the global NNT elimination target as set by the WHO.
Study Design: Retrospective study
Methods: This quantitative cross-sectional study involved mothers who gave birth to NNT babies between January 2008 and December 2013. . The study used secondary dataset collected by trained NNT surveillance officers in the northeast zone of Nigeria using a standard tool.
Results: Although the trend of NNT in the region showed a decrease in cases with fewer cases 9% (27/306) recorded in 2013, the prevalence rate of NNT was unacceptably high at 28.815%.
Conclusion: Though at a slow pace, it is clear that the measures put in place by the Nigerian government towards meeting the 2015 NNT elimination deadline is yielding positive results. In spite this, there is need for policy makers to increase their commitments to ensure that Nigeria meet up with the 2015 NNT elimination deadline.

Introduction

In 1988, the WHO estimated that around 787,000 newborn deaths were due to neonatal tetanus, indicating that an estimated proportionate mortality rate due to neonatal tetanus was 6.7 deaths per thousand live births; this shows the high magnitude of neonatal tetanus in global neonatal mortality[1-3]. These international bodies developed a strategic framework on NNT elimination with the aim of ensuring less than 1 case of NNT per 1,000 live births per annum in every district of every country[1-3]. Since the commencement campaign of NNT elimination, there has been a remarkable global progress recorded, and this is as a result of ensuring that the following strategies are in place: hygienic delivery of the newborn, routine immunization of pregnant women with tetanus toxoid (TT), immunization of women with 3 doses of tetanus toxoid vaccine during their childbearing age especially those living in high-risk areas, and improved NNT surveillance system[1-3]. Despite the global success recorded in the NNT elimination strategy, it is disheartening to note that Nigeria is still among the 25 remaining countries that are yet to achieve the NNT global elimination target set by the WHO[1-3].

Literature shows that the prevalence of NNT in the developing countries is more in the underserved communities; those that are down the social ladder, lack educational background, have low per capita income and lack access to quality healthcare. This is often as a result of unhygienic birth practices by parents in the rural areas due to lack of access to basic antenatal care services, health inequity, poverty, illiteracy, cultural barriers, beliefs and lots more, thus exposing umbilical cord of the newborn to the bacteria[1,2,4,5]. Thus, an increase in prevalence of NNT among the poorest and least developed countries of the world clearly indicates the growing health inequity and equality. It is not surprising that the 25 countries that have not reached the MNT elimination status are all under-developed. Still, 15 out of the 25 countries are from the African continent and also account for 90% of the global NNT cases: Angola, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, the Democratic Republic of Congo, Ethiopia, Guinea-Bissau, Liberia, Mali, Mauritania, Mozambique, Niger, Nigeria and Senegal[3,6,7].

Neonatal tetanus (NNT) is a deadly vaccine preventable disease and one of the most underreported diseases in the developing countries seen in the newborn within the first 28 days of life. The disease is caused by Clostridium tetani bacteria found especially in soil, dust and animal faeces. The disease has a high case fatality rate of at least 70% with worst cases seen in especially pregnant mothers and the newborn. NNT remains one of the leading causes of deaths among neonates in the developing countries with about 130,000 neonatal deaths recorded in 2004[1,2]. The global NNT elimination strategic framework requires that for a country to gain certification as free from NNT, recorded cases should be less than 1 per 1,000 live births per annum in every district of the country[3].

The standard NNT case definition considered in this study is any newborn who in the first 2-3 days of life was able to breastfeed normally and then suddenly became irritable, could not breastfeed and die within the first 28 days of life[19]. Also considered here, as neonatal tetanus is any death of a newborn child within the first 28 days of life for unexplained reasons[8].

In spite the fact that estimated NNT cases are less than 10% of the actual incidence, which is because of the substantial underreporting of neonatal mortality, NNT remains an important public health challenge in the Africa region. Although only few NNT population-based mortality and morbidity assessments were carried in the 1990s, there were an estimated 124,000 NNT cases with 93,000 deaths in 1999 alone. The NNT result released in 1999 showed that mortality is high on the continent especially in Nigeria (Congo-2/1000; Malawi-2/1000, Tanzania-2/1000; Ethiopia-7/1000; Niger-9/1000; and Nigeria-10-20/1000). However, a disease that has no cure, NNT in the African region is responsible for an average 110,000 deaths a year[1,2].

Methodology

This retrospective study is quantitative and cross-sectional using secondary data obtained from mothers who gave birth to NNT babies. The criterion for the selection of the eligible participants is that mothers within the child bearing age from six provinces in the northeast region of Nigeria whose newborn child died within the first 28 days of life due to symptoms consistent with the standard NNT case definition or as diagnosed by a paediatrician as a case of NNT.

Ethical approval for this study was obtained from the northeast regional office of the Nigerian National Primary Healthcare Development Agency (NPHCDA) for the sole purpose of this study. The NNT dataset obtained from the NPHCDA was for the period between January 2008 and December 2013. The data was collected from eligible participants in the region using a standard tool designed by the World Health Organization.

The northeast region, comprises of six provinces (Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe), and has Islam and Christianity as the two dominant religions. The main occupation of especially the rural dwellers in the less densely populated region of the country is farming and often with large-scale production of crops, and livestock. The northeast region, where the study was conducted, has poorer and worse health outcomes in comparison with other regions in the southern part of the country[9,10].

Informed consent of the participants was obtained from their husband and the local authorities prior administering the questionnaire. The participants were well informed on the purpose of administering the questionnaire in the local language that they all understood. The information obtained from the participants was securely kept in an official database, restricting access to the data except to authorize persons.

The instrument used in gathering information from the respondents has on its various columns the following: the first column for capturing demographic information of the NNT child, as well as that of the parents. Other columns are tailored to obtain information on the mother's vaccination history, birth of an infant, initial clinical history, treatment, action taken in the form of response, and final classification of the case.

The quality of the items on the data collection instrument was sought with content validity. The instrument developed by the W.H.O. is a standard tool used internationally to collect data from suspected NNT cases. The content of the instrument clearly measures what it was expected to measure; thus validity and reliability of the measurement instrument was well tested[11,12].

Results

Inferential statistics was used to draw conclusions from the sample tested. The study used Statistical Package for the Social Sciences (SPSS) 22 to code and tabulate scores collected from the survey.

Using the estimated Nigeria's population of 180,049,322 (NPC, 2014), an estimated live birth in the northeast region of 1,082,754 based on the World Bank projected growth rate of 3.2 and CBR of 44.25, and a sample size of 312 NNT cases between 1st January 2008 and 31st December 2013, the prevalence rate of NNT per 1,000 live births in the northeast region was 28.815%.

Although 2008 recorded a fairly few number of cases of NNT cases 12.4% (38/306) probably because the surveillance system was not well established, the number of cases doubled in 2009 24.5% (75/306). The number of reported case increased in 2010 26% (80/306) considered as the peak throughout the period under study. The increase in the number of cases could be attributed to factors such as the improvement in the NNT surveillance system, increase awareness among the populace, increase commitment of the Nigerian government and other partner agencies working towards ensuring that the country meet up with the NNT elimination deadline. This information is shown is shown in Table 1, which is a cross tabulation of the babies' birth year and province. Additionally, analysis of the NNT cases as reported by each province in the northeast region as shown in Table 1, indicates that Borno province had the highest number of NNT cases 28% (86/306), followed by Bauchi 20% (61/306), then Taraba 18% (54/306), then Gombe 17% (52/306), while Yobe 9% (28/306), and Adamawa province recorded the lowest NNT cases 8% (25/306).

While the dataset for this study was screened for any missing data, an investigation using the frequency counts found several cases to be within the distributions. Out of the 312 participants in this study, two said that they had a child without NNT (n = 2), and five did not respond to NNT status ($n_{missing}$ = 5). The two NNT babies were both males with different backgrounds. That is, Case 157 was born in 2008 in the Borno province and the mother did not receive ANC, nor was she attended by a TBA; whereas, Case 260 was born in 2009 in the Taraba province, had received ANC, and had the umbilical cord treated. The information displayed in Table 2, is demographic breakdown of participants who gave birth to NNT babies and those who did not respond to NNT status.

Table 1

Cross Tabulation of the Babies' Birth Year and Province

	Birth Year						
Province	2008	2009	2010	2011	2012	2013	Total
Adamawa	1	2	5	7	7	3	25(8%)
Bauchi	1	16	21	14	8	1	61(20%)
Borno	17	29	22	6	4	8	86(28%)
Gombe	3	6	10	11	13	9	52(17%)
Taraba	3	15	16	5	9	6	54(18%)
Yobe	13	7	6	2	0	0	28(9%)
Total	38	75	80	45	41	27	306(100%)

Table 2

Demographic Breakdown of Participants who gave Birth to NNT Babies and those that did not Respond to NNT Status

Case #	Gender	Province	Birth Year	Received Care	Attended by TBA	Cord Treated
NNT Baby						
#157	Male	Borno	2008	No	No	n/a
#260	Male	Taraba	2009	Yes	n/a	Yes
Missing						
#112	Male	Borno	2009	No	No	No
#118	Female	Borno	2009	No	No	No
#119	Female	Borno	2009	No	No	No
#178	Male	Gombe	2010	Yes	n/a	Yes
#201	Male	Gombe	2010	Yes	n/a	Yes

Note. n/a = no response provided

Discussion

As highlighted in previous researches, the high NNT prevalence rate primarily seen in the developing countries more especially the underserved communities who are down the social ladder having low per capita income, who lack educational background and who lack access to quality antenatal care services[18]. However, the resultant effect of these factors include home delivery of the unvaccinated mothers by untrained birth attendants as is the practice in the rural areas through unhygienic birth practices, unhygienic handling of the umbilical cord of the unprotected newborn child, and thus getting infected with the tetanus bacteria[1,2,4,5].

Although there is an appreciable decline in the NNT cases in the northeast region starting from 2010 (26%) to fewer recorded cases in 2013 (9%), the prevalence of NNT in the northeast region between January 2008 and December 2013 was undoubtedly high at 28.815%. The downward trend in the number of NNT cases observed within the period under study could be attributed to the improved measures by the Nigerian government towards ensuring that the country meet with the 2015 global NNT elimination deadline[13-15].

Several researchers have observed that significant contributors to the high incidence of NNT in Nigeria include declining TT vaccine coverage rate among pregnant women and delivery by untrained personnel[5,16,18]. Thus, there is the need to underscore the importance of stakeholder participation, and further suggested the need for school-based immunization; supplementary immunization; increase community awareness on tetanus immunization; retraining of TBAs/other alternative care providers and to improve access to health care services[5,16,18]. The importance of tetanus toxoid in the prevention of maternal and neonatal tetanus is clear[17], hence the need to make women understand NNT as a disease and the benefits of the tetanus toxoid vaccine in its prevention.

Conclusion

This study was able to establish the NNT prevalence rate in the northeast region of Nigeria. Prior now, there was no robust study at both regional and national levels that establish the NNT prevalence rate in the country. With

this high regional prevalence rate of NNT in Nigeria, and looking at the fact that the revised deadline of December 2015 for the NNT elimination is just around the corner, it is paramount that policy makers in the health sector together with partner agencies to strive hard and ensure that women of child bearing age have unhindered access to quality ANC, increase visibility of vaccination activities in the rural areas, increase awareness among parents on the importance of ANCs, underscore the need for pregnant mothers to deliver in hospitals, give quality training to TBAs and other existing personnel in the maternal and newborn units, employ additional health professionals, and make adequate provision for health facilities that would render mobile ANC services in the hard-to-reach communities[18,19,20].

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Conflicts of Interest
The authors wish to declare that there is no any conflict of interest or royalty attached to this study.

Key-points
- The study establish the true prevalence of NNT in the northeastern Nigeria
- The measures put in place by the Nigerian government to meet with the 2015 NNT elimination deadline is yielding positive results as evidenced by decline in the number of NNT cases in the region between 2008-2013.

The policy implication for this study is that policy makers in Nigeria should be more committed towards ensuring that all women of childbearing age are fully vaccinated with the tetanus toxoid.

References
1. WHO (2004). ‘‘The Global Burden of Disease 2004 Update’’ Retrieved from http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.html
2. Roper, M. H., Vandelaer, J. H., & Gasse, F. L. (2007). Maternal and neonatal tetanus. *Lancet, 370,* 1947–59.
3. UNICEF, WHO, UNFPA (2000). Maternal and neonatal tetanus elimination by 2005. Strategies for achieving and maintaining elimination. Retrieved from http://www.unicef.org/health/files/MNTE%5Fstrategy%5Fpaper.pdf
4. Ogunlesi, T. A. (2011). Vaccines for women to prevent neonatal tetanus: RHL commentary. *The WHO Reproductive Health Library*; Geneva: World Health Organization. Retrieved from http://apps.who.int/rhl/newborn/cd002959_Ogunlesit_com/en/
5. Akani, N. A., Nte, A. R., & Oruamabo, R. S. (2004). Neonatal tetanus in Nigeria: One social scourge too many! *Nig J of Paediatrics, 3,* 1-9. Retrieved from http://www.ajol.info/index.php/njp/article/viewFile/12080/15198
6. WHO (2014). Maternal and Neonatal Tetanus (MNT) elimination: The initiative and challenges. Retrieved from http://www.who.int/immunization/diseases/MNTE_initiative/en/
7. UNICEF (2014). Elimination of maternal and neonatal tetanus. Retrieved from http://www.unicef.org/health/index_43509.html
8. WHO (n.d.). Global Alert and Response: Recommended Surveillance Standards (2nd ed.). WHO/CDS/CSR/ISR/99.2 Retrieved from http://www.who.int/csr/resources/publications/surveillance/whocdscsrisr992.pdf
9. Central Intelligence Agency (2014). The World Fact book: Country Comparison. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html
10. Nigeria Demographic and Health Survey (2008): North East. UNICEF 2009 Publication. Retrieved from http://www.unicef.org/nigeria/ng_publications_North_East_zonal_fact_sheet_(En glish).pdf
11. Frankfort-Nachmias, C., & Nachmias, D. (2008). Research methods in the social sciences (7th ed.). New York: Worth.
12. Szklo, M., & Nieto, F. J. (2014). *Epidemiology: Beyond the basics* (3rd ed.). Sudbury, MA: Jones and Bartlett
13. Awosika, A. (2000). Boosting routine immunization in Nigeria: issues and proposed action points. Retrieved from http://www.afro.who.int.ezp.waldenulibrary.org/ddc/vpd/2000tfi:/
14. Alhaji, M. A., Bello, M. A., Elechi, H. A., Akuhwa, R. T., Bukar, F. L., & Ibrahim, H. A. (2013). A review of neonatal tetanus in University of Maiduguri Teaching Hospital, northeastern Nigeria. *Niger Med J, 54(6):* 398–401. doi: 10.4103/0300- 1652.126294
15. Onalo, R., Ishiaku, H. M., & Ogala, W. N. (2011). Prevalence and outcome of neonatal tetanus in Zaria,

northwestern Nigeria. *J Infect Dev Countries, 5(4),* 255-259. Retrieved from www.ncbi.nlm.nih.gov/pubmed/21537066

16. Sani, M. N., Galadima, M., Ameh, J. B., Kawo, A. H. & Kurawa, S. M. (2010). Serological evaluation of protective immunity against tetanus in pregnant women attending some rural hospitals in Kano, northern Nigeria. *Bayero Journal of Pure and Applied Sciences, 3(1),* 39-42. Retrieved from http://ecc.isc.gov.ir/ShwFArticle.aspx?aid=594864
17. Blencowe, H., Lawn, J., Vandelaer, J., Roper, M., & Cousens, S. (2010). Tetanus toxoid immunization to reduce mortality from neonatal tetanus. *Int J of Epidemiology, 39,* i102–i109. doi:10.1093/ije/dyq027
18. Saleh JEA., Nemecek J., & Jones C. (2015). Antenatal care services and neonatal tetanus: an outlook at the northeastern Nigeria. Pediatr Infect Dis. http://dx.doi.org/10.1016/ j.pid.2015.03.001.
19. Saleh, JEA., Walla, AH., & Adamu, US. (2015). Do traditional Birth Attendants (TBAs) Have a Role in the Prevention of Neonatal Tetanus. American Journal of Health Research. 3(3).189-193. doi: 10.11648/j.ajhr.20150303.24
20. Saleh JA, Nemecek J, & Jones C. Impact of hygienic caring of the umbilical cord in the prevention of neonatal tetanus. WebmedCentral PUBLIC HEALTH 2015;6(5):WMC004891

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