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Walden University

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Jalal-Eddeen Saleh

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Walden University
2014

Abstract

Prevalence of Neonatal Tetanus in Northeastern Nigeria

by

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MSc, London School of Hygiene and Tropical Medicine, 2011

Diploma in Internal Medicine, Imperial College London, 2004

MBBS, University of Maiduguri, 1994

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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December 2014

Abstract

Although efforts have been made towards improving the health of children across the globe with notable results, neonatal tetanus (NNT) remains a major contributor to the neonatal death rates in Nigeria. This problem calls for a concerted effort by the government to achieve the revised global NNT elimination deadline of 2015. The purpose of this cross-sectional quantitative study using secondary data was to establish the prevalence of NNT in Nigeria's northeast region and to ascertain if there was any significant difference in frequency of antenatal care (ANC), trained traditional birth attendants (TBAs), and umbilical cord treatments, using single sample proportions test and chi-squared tests of independence. The framework for this research was the theory of planned behavior. The participants ($N = 312$) were mothers of NNT babies. In spite a continual decline in the NNT cases between 2010 (26%) and 2013 (9%), the prevalence rate of NNT was unacceptably high at 28.815%. Also, significant differences existed as mothers who gave birth to NNT babies received significantly fewer or no ANC ($p < 0.001$), received significantly fewer or no attention from TBAs ($p < 0.001$), and reported significantly fewer incidences of proper umbilical cord treatments ($p < 0.001$). The chi-squared tests of independence resulted in significant differences in the frequencies of mothers who received ANC between Nigerian provinces ($p < 0.001$) and mothers who had their baby's umbilical cord treated ($p = 0.005$). This study will contribute to social change by guiding health care policy makers and immunization program managers on maternal and newborn health care services and indicate ways to build capacity of the TBAs for safe home delivery/hygienic handling of umbilical cord of newborns.

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Dedication

To my wife, Fadimatu, and children, Shuaib, Muawiya, Zainab, and Aisha.

Acknowledgments

I thank the almighty God for making this doctoral work a success. I remain thankful to my wife, Fadimatu, and children, Shuaib, Muawiya, Zainab, and Aisha, for their untiring support over the period of my studies; their understanding, patience, and commitment to this noble goal is symbolic of their true love. I could not have achieved this academic excellence without them by my side.

I thank my parents, Saleh Michika and Aisha-Daudu Saleh, for teaching me the values of life and for their support and guidance; I will forever remain grateful to them. I also thank my colleagues at the World Health Organization Bauchi for their encouragement to pursue this noble cause in spite the competing needs and challenges of the global polio eradication initiatives; I am proud to call these distinguished colleagues as truly mine.

Finally, but by no means least, I thank the members of my dissertation committee, Dr. John Nemecek, Dr. Chester Jones, and Dr. Suzanne Richins, for their support, guidance, dedication, and commitment to ensure that I earn the highest academic achievement. You will truly remain indelible in my mind.

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Chapter 1: Introduction to the Study

Overview

Although several efforts have been made towards improving the health of children across the globe, with notable results obtained especially in the developed countries, the developing countries are still having enormous challenges with high infant and neonatal death rates. It is estimated that out of the 10 million children under the age of 5 years who die annually across the globe, 4 million of these deaths occur within the first 28 days of life of these children (World Health Organization [WHO], 2004; Kippenberg et al., 2005; The Millenium Development Goals [MDG] Report, 2012).. However, two third of these neonatal deaths, which are preventable, are as a result of vaccine-preventable diseases, prematurity, and birth asphyxia. It is disheartening to note that 99% of these deaths are seen in the low and mid-income countries of the world (WHO 2004; Kippenberg et al., 2005; The MDG Report, 2012).

The purpose of this study was to establish the prevalence of NNT in the northeastern region of Nigeria and to ascertain if there was any significant difference in frequency of antenatal care (ANC), trained traditional birth attendants (TBAs), and umbilical cord treatments, so as to know the reasons for Nigeria's failure to meet the deadline of the global NNT elimination strategic plan. The incidence rate of NNT in Nigeria ranges between 14.6 and 20 per 1,000 live births (Federal Ministry of Health and Human Services [FMHHS], 1992). While NNT accounts for 7% of all neonatal deaths globally, it is estimated that the figure in Nigeria is up to 20% (Oruamabo, 2007), thus contributing 16% of the global NNT deaths (UNICEF, WHO, UNFPA, 2000). It is clear

that NNT is a major contributor to the neonatal death rates in Nigeria. This problem calls for a concerted effort by the government and other stakeholders to achieve the revised global NNT elimination deadline of 2015.

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 (WHO, 2014; UNICEF, 2014). Although only a 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 (WHO, 2014; UNICEF, 2014). The NNT results released in 1999 showed that mortality is high on the continent, especially in Nigeria (Congo-2/1,000, Malawi-2/1,000, Tanzania-2/1000, Ethiopia-7/1000, Niger-9/1000, and Nigeria-10-20/1000) (WHO, 2014; UNICEF, 2014). A disease that has no cure, NNT in the African region is responsible for an average 110,000 deaths a year (WHO, 2014; UNICEF, 2014).

In 1988, the WHO estimated that around 787,000 newborns deaths were due to NNT, indicating that an estimated proportionate mortality rate due to NNT was 6.7 deaths per thousand live births. This number shows the high magnitude of NNT in global neonatal mortality (UNICEF, WHO, UNFPA, 2000). It is as a result of these alarming statistics that the 42nd World Health Assembly (WHA) held in 1989 called for the elimination of maternal and neonatal tetanus (MNT) by 1995 (UNICEF, WHO, UNFPA, 2000). Furthermore, the World Summit for Children held in 1990 listed neonatal tetanus elimination as one of its goals; this goal was endorsed once again in 1991 at the 44th WHA.

The slow implementation of the recommended MNT elimination strategies by countries around the world resulted in a change in the target date for MNT elimination to 2000. The WHO, UNICEF, and UNFPA came together to review progress towards the attainment of the global elimination goal in 1999; these bodies realized that there was a need for review of the initiative, adding elimination of maternal tetanus to the initial NNT elimination goal with a change in date to a 2005 target, which was subsequently changed to 2015 (WHO, 2014; UNICEF, 2014).

Background

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. NNT remains one of the leading causes of deaths among neonates in the developing countries with about 130,000 neonatal deaths recorded in 2004 (WHO, 2004; Roper, Vandelaer, & Gasse, 2007). The disease is caused by Clostridium tetani bacteria found especially in soil, dust and animal feces (WHO, 2004). The disease has a high case fatality rate of at least 70%, with worst cases seen in especially pregnant mothers and the newborn (WHO, 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 (UNICEF, WHO, UNFPA, 2000). 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. Since the commencement campaign of NNT elimination, there has been remarkable global progress recorded 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 three doses of tetanus toxoid vaccine during their childbearing age, especially those living in high-risk areas; and improved NNT surveillance system (UNICEF, WHO, UNFPA, 2000). 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 (UNICEF, WHO, UNFPA, 2000).

In the 2010 report, the WHO estimated that 58,000 newborns died as a result of NNT, a 93% reduction from the late 1980s. In spite the appreciable progress made in this regard, statistics show that as of December 2013, 25 countries still have not reached the MNT elimination status (UNICEF, WHO, UNFPA, 2000; WHO, 2014). However, there is optimism that many additional countries are likely to meet the revised deadline of 2015 (UNICEF, WHO, UNFPA, 2000; WHO, 2014).

In this study, I examined available literature on NNT with special reference to Nigeria to see if these studies were able to indicate the reasons why Nigeria could not achieve the NNT elimination target of 1995. Furthermore, I examined the prevalence of NNT in the northeastern region of Nigeria to understand the reasons behind poor utilization of antenatal services by pregnant women, cultural beliefs of mothers towards ANC services, reasons behind the lack of trained birth attendants to receive deliveries, and the unclean birth practices among rural women.

The global NNT elimination initiative, which aims to reduce the disease to a level that is no longer a major public health problem, requires achieving the following: immunization of pregnant women and other women of reproductive age (WRA) and practice of hygienic deliveries and clean cord care (UNICEF, WHO, UNFPA, 2000). Since the campaign for elimination of NNT started in 1994, 104 out of the 161 developing countries have been able to achieve the goal, with 22 other countries close to achieving it (UNICEF, WHO, UNFPA, 2000). This elimination campaign has led to a decrease in deaths from NNT across the globe, from 470,000 to 215,000 (UNICEF, WHO, UNFPA, 2000). However, in spite of the significant achievement of the NNT elimination campaign and the millennium development goals (MDG) goal four, targeting a reduction in infant mortality deaths across the globe by 2015 (MDG, 2013), NNT is still among the leading causes of death in 25 developing countries. Literature has shown that there are at least 355,000 cases of neonatal tetanus across the globe annually, resulting in about 250,000 deaths (MDG, 2013).

Although significant achievement has been made in the current global fight against MNT, much needs to be done to ensure that this vaccine preventable disease (VPD) is totally eliminated across the globe. In spite of the increased commitment from governments of countries struggling with NNT, it is estimated that only 5% of cases are reported to the health services, especially within the underdeveloped countries. It implies that the actual NNT death rates are greater than what the surveillance system captures. In an attempt to improve on the sensitivity of the NNT surveillance system, the WHO recommended the use of NNT case-based investigation as part of the strategies for

countries to achieve the NNT elimination target. The NNT case-based surveillance, in addition to improving the sensitivity of the NNT surveillance system, also aims to ensure that all suspected NNT cases are fully investigated (UNICEF, WHO, UNFPA, 2000).

In 1997, the effort of the Nigerian government towards addressing the problem of inadequate vaccine coverage among pregnant women and women of childbearing age, and towards achieving the elimination strategy, was the replacement of the expanded program on immunization with the national program on immunization (Awosika, 2000). Fetuga et al. (2009) observed that this change did not yield significant differences in the prevalence and case fatality rates of NNT. The NNT case-based surveillance established by the WHO is aimed at investigating individual records of suspected NNT cases. In its effort to strengthen its NNT surveillance and ensure that no NNT is missed, the Nigerian government commenced the NNT case-based surveillance in 2007.

An additional strategy that the Nigerian government adopted is the phased elimination of NNT, focusing on the Southeast and Southwest in 2013-2014 followed by the remaining four zones (Alhaji et al., 2013). In spite of this effort, the NNT elimination strategy in Nigeria has not yielded significant results. Reasons for this failure may include underreporting of NNT by health facilities, lack of sensitivity of NNT surveillance system to detect NNT cases especially from rural areas, lack of proper understanding of NNT case definitions by the disease surveillance and notification officers (DSNOs), lack of community awareness of NNT, cultural barriers from utilizing ANC by pregnant mothers, lack of access to the ANC services, and lack of routine immunization with TT during antenatal visits. It was observed that only about 5% of

NNT cases are being reported by health facilities across the country for reasons not unrelated to the ones mentioned earlier (UNICEF, WHO, UNFPA, 2000). Ide and Nte (2009) highlighted the need to make basic obstetric care accessible, to strengthen routine immunization, to make compulsory TT immunization to women of childbearing age, and to improve health care delivery as measures that ensure NNT elimination and reduce the associated high case fatality rate.

In 1989, while MNT was prevalent in both middle and low-income countries of the world, there was a remarkable reduction in the prevalence rate from 57 in 1999 to 25 as of December 2013. Furthermore, the WHO estimated in 2010 that there was a significant reduction in the NNT neonatal death rates to about 58,000 newborns; this figure shows a 93% reduction in neonatal death rates from NNT when compared with neonatal death rates recorded in the 1980s (UNICEF [United Nations Children's Fund], 2014; UNICEF, WHO, UNFPA [United Nations Population Fund], 2000; WHO, 2014).

The prevalence of NNT in the developing countries is higher in the underserved communities that have lower social status, lack educational background, have low per capita income, and lack access to quality healthcare. Additionally, health inequity, poverty, illiteracy, cultural barriers, and beliefs, results in unhygienic birth practices. The resultant effect of these is the exposure of the umbilical cord to the tetanus bacteria (Ogunlesi, 2011; Akani et al., 2004; WHO, 2004; Roper et al., 2007). 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. As progress continues to be made globally, there are 25 countries, all of which are underdeveloped, that have not

reached the MNT elimination status. Furthermore, 15 out of the 25 countries with NNT are from the African continent: Angola, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, the Democratic Republic of Congo, Ethiopia, Guinea-Bissau, Liberia, Mali, Mauritania, Mozambique, Niger, Nigeria, and Senegal. These 15 countries account for 90% of the global NNT cases (UNICEF, WHO, UNFPA, 2000; WHO, 2014; UNICEF, 2014).

The 25 remaining countries are currently working toward achieving the NNT elimination goal, with increased commitment from their governments, partner agencies, and other stakeholders. The emergence of the MDG in 2000 has positively contributed to the reduction of the neonatal death rates, especially NNT; this is through improvement in both childhood immunizations and maternal health. The fourth MDG goal aims to reduce by two thirds the mortality rates among the children under the age of 5 years by 2015. Globally, the number of deaths in children under the age of 5 worldwide has dropped from more than 12 million in 1990 to 7.6 million in 2010 (The MDG Report, 2012). The rate of reduction in the developing world has been even more significant. In sub-Saharan Africa, which is the largest contributor of under-five mortality across the globe, under-five mortality rate has dropped from 1.2% annually from 1990-2000 to 2.4% annually between 2000-2010 (The MDG Report, 2012). Furthermore, adequate ANC during pregnancy serves as an intervention towards reducing both maternal and neonatal mortality rates across the globe. The ANC is critically important in reaching the mother with needed interventions as well as vital information to promote her well-being and that of her unborn child. Records show that one of the factors that contribute to the increasing

prevalence of MNT in the developing countries is the lack of skilled health professionals to attend to pregnant mothers and their newborns (The MDG Report, 2012).

Although child mortality rate has dropped by more than a third globally, the progress is slow as to meet with the 2015 target. This situation is especially true in the sub-Saharan Africa and Southern Asia regions because of there were up to 6.2 million child deaths in 2010 from these two regions, which is about 82% at a global scale (The MDG Report, 2012).

Although between 1990 and 2010 there was a recorded increase from 55% to 65% in the proportion of deliveries attended by skilled health personnel in the developing countries, the sub-Saharan African region still has the lowest coverage. In 2010, about half of the pregnant women in the sub-Saharan African region did not have the WHO recommended minimum of four ANC visits. In addition to the slow ANC coverage in the developing countries, there are large intra-regional disparities in terms of ANC coverage in Africa. In Southern Africa, where there is almost universal coverage in 2010, the story was far different in the West African region with nearly a third of pregnant women are without having access to ANC. Furthermore, the small proportion of mothers who received the ANC visits did not get the minimum required quality of care (The MDG Report, 2012). In a community-based survey conducted to assess the incidence of NNT, the outcome clearly shows NNT as a major contributor to neonatal deaths. The two main factors attributed to this include erosion of confidence in immunization by parents and lack of clean deliveries by those who deliver at home (WHO, 2007).

The achievement recorded in reducing the under-five death rates is not proportionate with that within the first 28 days of life. It is commendable that globally, the last two decades have recorded a slower decline in neonatal mortality when compared with the under-five mortality. This is notwithstanding the fact that neonatal death rates fell from 32 per 1,000 live births in 1990 to 23 per 1,000 live births in 2010. In other words, there is an average reduction in neonatal death rate of 1.7 percent annually; this, when compared with under-five mortality, indicates a much slower decline than the 2.2% per year reduction or a 2.3% reduction in maternal mortality within the last two decades (The MDG Report, 2012).

Globally, when the neonatal death is looked critically from among the under-five deaths, the trend shows an appreciable improvement from 37 percent decline in 1990 to above 40 percent in 2010. However, it is expected that this trend would continue if the decline in the under-five mortality rate were sustained. It is clear that, in 2010, the neonatal deaths from eastern and southern Asian regions comprised a 57% and 50% reduction in the overall under-five mortality rates. The sub-Saharan Africa, which suffers higher neonatal mortality rate of 35 deaths per 1,000 live births in 2010 clearly outweigh its southern and eastern Asian counterparts. When these three regions are compared, the sub-Saharan African region has the least improvement between 1990 and 2010. Thus, there is a need for government, partner agencies, and stakeholders to show commitment effectively to address the NNT scourge (The MDG Report, 2012).

In public health practice, immunization and surveillance are important measures to control and eliminate vaccine preventable diseases. In the current global NNT

elimination plan, the rationale for NNT surveillance is to ensure that all suspected cases are captured for further investigations to be carried out, treatment commenced, causes established and further actions taken. The global NNT elimination is through achieving the following three primary strategies:

- Vaccination of pregnant women with Tetanus toxoid
- Hygienic delivery of the newborn
- Identifying high-risk areas to implement corrective action in the form of immunization of women of childbearing-age.

To understand the problem of NNT in Nigeria, it is important to have some knowledge about the country itself. Nigeria is a secular country that gained independence on October 1, 1960 from Great Britain and is the most populous country in Africa, with an estimated population of 180,049,322 (National Population Commission [NPC], 2014). Nigeria has great cultural diversity with 374 identifiable ethnic groups (NDHS, 2008); the most populous and politically influential of these are Hausa and Fulani 29%, Yoruba 21%, Igbo 18%, Ijaw 10%, Kanuri 4%, Ibibio 3.5%, and Tiv 2.5% (NDHS, 2008; CIA, 2014). In addition to English, which is the country's official language, other languages that are widely spoken include Hausa, Yoruba, Igbo (Ibo), and Fulani. There are two major religions in Nigeria, Islam (50%) and Christianity (40%); the remaining 10% are indigenous beliefs (CIA, 2014). Nigeria has a birth rate of 38.03 births/1,000 population, making it 12th in the world, and a death rate of 13.16 deaths/1,000 population, 19th in the world (2014 est.). Maternal Mortality Rate (MMR) stands at 630 deaths/100,000 live births (2010) 11th in the world and Infant Mortality Rate (IMR) 74.09 deaths/1,000 10th

in the world. The country's health expenditure as at 2011 was 5.3% of GDP that is 127th in the world, with 0.4 physicians/1,000 population (2008), and hospital bed of 0.53 beds /1000 population (2004; CIA, 2014).

Although Nigeria was misruled by the military for 22 years before its return to civilian rule in 1999, the country sustained damages to the social, political, ethnic and geographic lines during the political and economic crises and conflict early in the 20th century (Ploch, 2007). The misrule, which undermined the authority and legitimacy of the state apparatus, resulted in decay of the health care infrastructure posing threat to the public health sector, with enormous social and economic challenges (Ploch, 2007). Although Nigeria's economy was rebased in April 2014 which placed the country first on the African continent, the economic diversification and strong growth recorded have not translated into a meaningful decline in poverty levels; this is because over 62% of the population live in extreme poverty (CIA, 2014). Among other factors, bad governance and increasing corruption in all sectors poses an additional challenge to the country's development; the resultant effect of these is the widening gap between the rich and poor leaving the citizenry to run a distressing life. This is more pronounced in the northeast region of the country where there is a rising level of illiteracy and increasing insecurity in the region.

Although those aged 15 and above can read and write thus representing 61.3% of the population, the rural dwellers are predominant illiterates. In Nigeria, the urban population constitutes about 49.6% of the total population (2011) at an urbanization rate of 3.75% per annum (2010-15 est.) (CIA, 2014). Nigeria is broadly divided into the south

and north regions; these regions are further sub-divided into six geopolitical zones – north central, northeast, northwest, southeast, south-south and southwest. The northeast sub-region, comprises of six states (Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe), and has Muslims as the dominant religion, whereas Hausa and Fulani are the major tribes. The northeast sub-region, which is less densely populated and well known for the production of crops and livestock, has poorer and worse health outcomes when compared with the southern region (NDHS, 2008).

The north and south regions have distinctly different socioeconomic status, as well as cultural and religious practices. This could explain the differences seen in the utilization of ANC services between these regions and in the prevalence of the vaccine preventable diseases. In the north, there are 90.1% of women who are more likely to deliver at home as compared to 22.5% in the south. Furthermore, births attended to by a skilled professional in the southern region are about 81.8% in comparison with as low as 9.8% in the north (NDHS, 2008).

Furthermore, the northeast sub-region has interesting health statistics (see Table 1): total fertility rate of 7.2 (national 5.7), women age 15-19 who are mothers 39% (national 23%), women who gave birth in the last 5 years and received ANC from a skilled provider 43% (national 58%), Births assisted by a skilled provider 16% (national 39%), Births delivered in a health facility 13% (national 35%), Children 12–23 months fully immunized 8% (national 23%), Children 12–23 months with no immunizations 33 (national 29%), Literate women age 15–49/men age 15–49, stands at 23/54 (national

54/77%), and those with no education women age 15–49/men age 15–49, stands at 68/45 (national 36/19%) (NDHS, 2008).

Table 1

2008 Nigeria Demographic and Health Survey (NDHS) for the Northeast in Comparison to National Figures

2008 Nigeria Demographic and Health Survey (NDHS): North East	Nigeria	North-East Zone
Fertility		
Total fertility rate	5.7	7.2
Women age 15–19 who are mothers or now pregnant (%)	23	39
Births that occurred less than 2 years after the preceding birth (%)	24	25
Current use of any modern method (currently married women 15–49) (%)	10	4
Maternal and Child Health		
A. Maternity care		
Women who gave birth in the last 5 years who received antenatal care from a skilled provider1 (%)	58	43
Births assisted by a skilled provider1 (%)	39	16
Births delivered in a health facility (%)	35	13
B. Child immunization		
Children 12–23 months fully immunized2 (%)	23	8
Children 12–23 months with no immunizations (%)	29	33
Literacy		
Literate (women 15–49/men 15–49) (%)	54/77	23/54
No education (women 15–49/men 15–49) (%)	36/19	68/45

Note. 1 Skilled provider includes doctor, nurse/midwife, or auxiliary nurse/midwife. 2 Fully immunized include BCG, measles, and three doses each of DPT and polio (NDHS, 2008).

Problem Statement

Nigeria has been unable to achieve the neonatal tetanus (NNT) global elimination target as set by the WHO (UNICEF, WHO, UNFPA, 2000; Lawn, Cousens, &

Wilczynska, 2005). This distinction places Nigeria among the 25 remaining countries still reporting NNT as a cause of infant mortality (UNICEF, WHO, UNFPA, 2000; Lawn et al., 2005). There is no study that established regional or national prevalence of NNT or explain Nigeria's failure to achieve the global NNT elimination deadline as set by the WHO and UNICEF. This indicates a serious gap in the literature that begs to be studied.

Preliminary evidence demonstrates that there is an increase in prevalence of NNT in Nigeria as cases are still being reported in especially the northeast region of the country. This justifies that this problem is very meaningful to policy makers, healthcare providers, mothers, and their unborn children. It is suspected that this increase might be associated with factors that include: cultural barriers preventing mothers from attending ANC services; lack of awareness of NNT within the community; inability to access quality ANCs/delivery at the rural areas; religious beliefs; preference for home deliveries in the rural areas; and lack of trained TBA (Akani, Nte & Oruamabo, 2004; Eregie & Oforwe, 1995; Sani, Galadima, Ameh, Kawo, and Kurawa, 2010).

Purpose of the Study

It has been shown that out of the more than 4 million neonatal annual global deaths, 38% is as a result of NNT (Lawn, Cousens, and Zupan, 2005). It is overwhelming to note that Nigeria is not an exception to this scourge, as NNT remains a significant cause of death among children under the age of 5 years (Peterside, Duru, & George, 2012). Literature has shown that in spite the increase in use of tetanus toxoid immunization across the globe and the significant reductions in deaths due to NNT, its

elimination is still far from reality in some developing countries especially from the sub-Saharan Africa (Peterside et al., 2012).

The purpose of this study was to establish reasons for Nigeria's failure to meet the deadline of the global NNT elimination strategic plan. The three independent variables (IV) were as follows: mothers receiving ANC; hygienic caring of the umbilical cord; delivery attended by trained TBAs, while status of the newborn (NNT) was the dependent variable (DV). In this study, I considered the following research questions:

Research Questions and Hypotheses

The research questions and hypotheses for this study are as follows:

RQ1 – Quantitative: Did mothers who gave birth to NNT babies receive ANC?

Ho_1: Mothers who gave birth to NNT babies did not receive ANC while pregnant.

Ha_1: Mothers who gave birth to NNT babies did receive ANC while pregnant

RQ2 – Quantitative: Did mothers who deliver at home get the attention of trained TBAs?

Ho_2: Mothers who deliver at home did not get the attention of trained TBAs.

Ha_2: Mothers who deliver at home did get the attention of trained TBAs.

RQ3 – Quantitative: Did mothers treat the umbilical cord of their newborn babies after birth in a hygienic way?

Ho_3: Mothers who gave birth to NNT babies did not treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Ha_3: Mothers who gave birth to NNT babies did treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Theoretical and Conceptual Framework

The theoretical framework considered for use in this research was the theory of planned behavior (TPB)/theory of reasoned action (TRA). The TPB is considered as a modified model of the TRA, which was meant to be applied to the prediction of purely volitional behaviors, and to help understand psychological determinants of individuals (Ajzen & Fishbein, 1980; Glanz, Rimer, & Viswanath, 2008). The TRA assumes humans making systematic use of information available to them and behaving in a rational manner. The TRA also observes that most of the actions of subjects are built on volitional behaviors; this implies that the intention of a person on performing or not performing a certain behavior is determined by his action. It implies that an individual's intention depends on two essential determinants: the first is an attitude towards individual's behavior, which is vital in the evaluation of the positive or negative attributes of an individual towards performing a behavior, and the second is the perception of the social pressures on the person on to either to carry out or not the behavior (Glanz et al., 2008).

The TPB significantly emphasizes on how behavioral intention of humans can be carried out. TPB helps researchers to understand the distinction between what an individual intends to do and what the individual will do. Often, people expect to perform a particular behavior when they intend to try it once again and especially if they believe that they have control over it; this is notwithstanding the fact that behavioral intentions and expectations could differ based on the situation. Furthermore, the behavioral intentions of humans can change once they realize that their behavioral goal is not entirely under their volitional control. Additionally, the actual behavior of individuals

could be predicted more accurately based on their behavioral expectations better than their behavioral intentions (Ajzen & Fishbein, 1980; Glanz et al., 2008).

The TPB as a theoretical framework has been applied in predicting a wide range of different human behaviors. This theory uses three predictors: attitude, subjective norm and perceived behavioral control, to show that human behavior is dependent on the intention to perform the behavior (Glanz et al., 2008). Applying TPB to a predictive model of NNT, there are various determinants of preventive behavioral intention among the women towards NNT. The beliefs of pregnant women on the outcomes of their pregnancies after they attend ANC, receiving tetanus toxoid vaccination and delivering in a hospital setting are all dependent on how the women value these which also determine their attitudes toward receiving a tetanus toxoid vaccine to prevent their unborn child from the NNT.

Nature of the Study

The quantitative cross-sectional study used NNT archival data to establish the prevalence of NNT in northeast region of Nigeria, and to ascertain if there is any significant difference in frequency of ANC, trained TBAs, and umbilical cord treatments, so as to know reasons for Nigeria's failure to meet the deadline of the global NNT elimination strategic plan. The rationale for the selection of cross-sectional survey design in this quantitative research is because of its wider applicability and that it provides numerical descriptions of trends, opinions, as well as measure level of occurrence of an event (Creswell, 2009). The design gives a good measure on how many members of the population have particular knowledge, assess their attitudes, and or their engagement in a

particular behavior (Siegel and Lotenberg, 2007; Creswell, 2009). The three independent variables were mothers receiving ANC; hygienic caring of the umbilical cord; delivery attended by trained TBA; while the dependent variable was status of the newborn (NNT).

Definitions of Terms

The following definitions are used in this study:

Antenatal care: Care of the pregnant mother by recording her medical history, assessing her health needs, giving advice and guidance related to the pregnancy and delivery of the unborn child, conducting essential screening tests and treatment for infections, educating her on self-care throughout pregnancy, identifying those conditions that are detrimental during pregnancy, as well as giving first-line management and referral when necessary. The WHO recommended a minimum of four ANC visits throughout the period of pregnancy (WHO, n.d.).

Antenatal care coverage: The percentage of women who use ANC as provided by skilled birth attendants for reasons that are related to pregnancy at least once during pregnancy; this percentage includes women who gave birth to a live child at a point in time.

Case definition: Is a set of diagnostic criteria that must be fulfilled for a suspected NNT case to be regarded as a case for investigation purposes. This can be based on established clinical criteria, laboratory criteria, or both within a given time, place, and person (WHO, n.d.).

Case fatality rate: Is the proportion of NNT cases that are fatal within a specified time (WHO, n.d.).

Confirmed NNT: Is any newborn child with the normal ability to suck and cry during the first 2 days of life, and then between 3 and 28 days of life could not suck normally, becomes stiff or has convulsions or both (WHO, n.d.).

Essential newborn care: Is a set of practices that aim to reduce neonatal morbidity and mortality, (e.g., clean cord care, thermal care by keeping baby warm) through the act of wrapping newborn in a clean, dry cloth, delayed bathing until 24 hours after birth, and commencing breastfeeding immediately after birth (WHO, n.d.).

Expanded programme on immunization (EPI): It was launched by the WHO in 1974 initially targets 6 childhood killer diseases i.e., polio, diphtheria, tuberculosis, pertussis (whooping cough), measles and tetanus (MNT). EPI aims to create population immunity among the children under the age of one year and pregnant mothers through immunization and provision of vaccines and other consumables. The current EPI goals are: to ensure full immunization of children under one year of age in every district, to global polio eradication, reduce MNT to an incidence rate of ≤ 1 case per 1,000 live births by 2015, cut to half the number of measles-related deaths, and ensure that all new vaccine/preventive health interventions reached all eligible children in districts across the world (WHO, 2005).

Health inequality: Is the wide-ranging differences that exist between different groups of people with respect to countries, regions, genetics, and socio-economic status among others. The socioeconomic conditions and their effects on the lives of the populace greatly determine their risk to illnesses; so also are the actions taken to prevent

them becoming ill or treat illness when it occurs. Health inequity cannot be eliminated completely but could be reduced (WHO, 2013).

Health inequity: Is the avoidable inequalities in health between groups of people within countries and between countries. These unfair inequalities are remediable at least in theory. While there is interplay between biological and genetic determinants of health of individuals and the population at large, factors such as income, social lifestyles, culture, working and residential environments and government policies are also key (WHO, 2013).

Live birth: Is the complete expulsion or extraction of a product of conception from a pregnant mother; this is irrespective of the duration of the pregnancy and that after such separation, the newborn breathes or shows any sign of life (*e.g.* heartbeat, pulsation of the umbilical cord or definite movement of voluntary muscles). This state is irrespective of whether or not the umbilical cord has been cut, or the placenta is still attached.

Maternal death: Death of a woman as a result of pregnancy-related complications that occur from the beginning of pregnancy, during labour or childbirth, and within the six weeks postpartum period. Often the causes are haemorrhage, infection, high blood pressure, unsafe abortion, and obstructed labour (WHO, n.d.).

Maternal services: Services considered essential for pregnant women as well as new mothers e.g. ANC, delivery care, postnatal care and birth preparedness. It aims to ensure good health of the mothers and their babies (WHO, n.d.).

Maternal tetanus: Tetanus that occurs during pregnancy or within six weeks after delivery, abortion, or spontaneous pregnancy loss. Patients often present with the generalized symptoms described (WHO, n.d.).

National programme on immunization (NPI): Change in EPI strategy by the Nigerian government in 1997 as a result of perceived failure of the EPI. The NPI, in line with the government's national vision, which has same objectives as the EPI aims to: improve and sustain routine immunization coverage of all antigens to 90% by the year 2020; achieve through quality supplemental activities, interruption of polio transmission; eliminate MNT; develop annual plans to prevent, detect, control and eliminate the occurrence of out-breaks of cerebrospinal meningitis, measles, yellow fever and other vaccine preventable diseases across the country (NPHCDA [National Primary Healthcare Development Agency], 2009).

Neonates/Newborn: Is a newborn baby aged 0-28 days of birth.

Neonatal tetanus: Is a newborn who in the first 2-3 days of life was able to breastfeed, and then suddenly became irritable, could not breastfeed and die within the first 28 days of life. Often symptoms start between days 3 and 14 after birth; the neonate develops some stiffness of the jaw/neck, generalized spasms/rigidity of the abdominal and muscles (Blencowe, Lawn, Vandelaer, Roper, & Cousens, 2010). Also considered as NNT is any death of a newborn child within the first 28 days of life for unexplained reasons (WHO, n.d.).

Neonatal tetanus elimination: Is the elimination of tetanus to less than 1 case of NNT per 1,000 live births in every district (Afshar, Raju, Ansell, and Bleck, 2011; UNICEF, 2014).

Postnatal Care (PNC): Care provided to women and the newborn baby following the delivery up to 42 days. The World Health Organization guidelines recommend that postnatal care for mothers include monitoring and referral for complications such as excessive bleeding, pain, and infection; counselling on breast care and breastfeeding; and advice on nutrition during breastfeeding, newborn care practices, and family planning. For all newborns, PNC should include immediate and exclusive breastfeeding, warming of the infant, hygienic care of the umbilical cord, and timely identification of danger signs with referral and treatment (WHO, n.d.). It is important to note that more than 60% of maternal deaths occur during the postnatal period thus exposing the newborn child to high increase risk mortality with NNT as one of the causes (Gill et al., 2007).

Prevalence: The occurrences of the health indicator during the specified time period divided by the size of the population in which the health indicator occurs, expressed as a percentage (Szklo & Nieto, 2014).

$$\text{Prevalence} = \frac{\text{Persons with a given health indicator during a specified time period}}{\text{Population during the same time period}} \times 1000$$

Primary health care: As stated at Alma Ata Conference, "is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their

full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self- reliance and self-determination." (WHO, n.d.).

Safe cord cutting: The practice of cutting a newborn's cord with the help of the clean instrument such as a new or boiled razor blade.

Skilled birth attendant (SBA): Is a licensed accredited health professional e.g., a midwife, nurse, or medical doctor who has been educated, trained, and acquired the requisite skills to manage uncomplicated pregnancies, from the antenatal period, childbirth, and the immediate postnatal period. Furthermore, the SBA is expected to be able clearly to identify, manage and refer complications that may arise in these women and the newborns (WHO, 2005).

Social determinants of health: Are a wider set of forces (economics, social policies, and politics) that shapes the conditions in which people are born, grow up, live, work and age, and the systems put in place to deal with illness (WHO, 2013).

Social gradient in health: Is a global phenomenon that runs from top to bottom along the socioeconomic spectrum. It means that health inequities affect everyone as seen in low, middle and high-income countries. Still, those down the social ladder have the worst health. The evidence shows that within countries, individuals with low socioeconomic position have the worse health outcome (WHO, 2013).

Suspected NNT: Any death of the newborn that occurred between 3-28 days of age in which the cause is unknown, or any neonate reported as having suffered from neonatal tetanus between 3-28 days of age and not investigated (WHO, n.d.).

Tetanus: A potentially fatal disease of sudden onset and caused by a spore-forming gram-positive obligate anaerobic bacterium. The spores of the bacterium, which are found primarily in the soil, are also present in the animal and human faeces. The bacteria gain entry into the human body through an opening in the skin, germinate in the tissues and then produces a potent neurotoxin with a minimum lethal human dose of < 2.5 ng/kg (Guimaraes et al., 2009). Infection in the newborns is usually through the unhealed umbilical stump especially when is cut with a non-sterile instrument. The disease manifests as muscle stiffness that usually starts in the jaw (lockjaw) and neck and later becomes generalized (Afshar et al., 2011).

Traditional birth attendant (TBA): A person that assists mothers during childbirth and initially acquired her skills by delivering babies herself or through apprenticeship to other TBAs (WHO, 1992). Traditional birth attendants, trained or not, are excluded from the category of a skilled attendant at delivery (WHO, n.d.).

Umbilical cord care: The umbilical cord which transports nutrients from the mother to baby in-utero cease to function after birth; the stump usually dries up and falls off within 1-2 weeks after the newborn is born. The umbilical cord care aims to ensure that infection by especially tetanus bacteria and irritation of any sort are avoided; this could be done by keeping the cord clean by adhering to either or all of the following: rubbing the base of the cord with a methylated spirit, or using Goldenseal root and Echinacea; keeping the area dry through adequate ventilation; using sponge bath until after the cord falls off, and allowing the cord to heal naturally (American Pregnancy Association, 2011).

Zero reporting: Reporting of "zero case" even when no cases have been detected by the reporting unit. This allows the next level of the reporting system to be sure that the participant has not sent data that have been lost, or that the participant has not forgotten to report (WHO, n.d.).

Assumptions

It is assumed that, since the advent of global NNT elimination game plan, developing countries have received increased attention and support from the WHO, UNICEF and other international organizations that partner with the elimination program. This support would have enabled the developing countries to meet up with the deadline of the NNT elimination, which was revised from 1989 to 2015. Although significant progress has been made in the global NNT elimination program, there are still 25 developing countries that are yet to achieve this thus still posing a threat to the program.

This study used secondary analysis of NNT archival data collected for the NPHCDA by the WHO field officers from the six provinces in the northeast region of Nigeria. Incidentally, the northeast region has poor health indicators in Nigeria and high reported cases of NNT. This study assumed that mothers of the NNT children gave an honest answer, and were able to recollect the incidence correctly during the data collection. The NNT data obtained from these states by the WHO through a standardized questionnaire were not primarily meant to answer research questions for this study; I assumed that the dataset for use in this research was accurate, very comprehensive contained all the information required for the study available.

Delimitations

The delimitations in this study included the fact NNT national data were not considered for this study; the data obtained were only from mothers of NNT children in the northeast region of Nigeria, and that the data, which were collected by WHO between January 2008 and December 2013 must have been shared with other partner agencies collaborating towards NNT elimination in Nigeria.

Limitations

Although secondary data received increased popularity especially in the conduct of quantitative research studies, these are not without some limitations due to some inherent challenges associated with its use. The main limitation was that the variables in this study were categorized slightly different form the variables in the NNT dataset. Thus, analyzing the NNT data that was previously collected not for the primary reason of this research was one important drawback. An example to this is that the data on treatment of umbilical cord, receiving ANC by mother, mother being attended by TBA, and diagnosing child as NNT were collected as numeric rather than as string variables. Additionally, the data on the measure of NNT was collected as ordinal rather than nominal.

Other limitations included differences in purpose for the collection of the data, differences in the sampling criteria, and differences in the data collection processes; thus responses from the patients were probably influenced by some variables that were unknown to me. Additional limitations included dealing with missing data from the database, and difficulties in accessing, downloading and documenting the NNT database.

Significance and Social Change Effect

This study is distinctive, as it established the prevalence of NNT in the northeast Nigeria; this result provides additional insight into national prevalence of NNT in Nigeria. The study addresses the existing gap on Nigeria's inability to achieve the NNT elimination target, to make an original contribution to a gap in the literature. The study results provides additional insight as to whether mothers whose children died of NNT accessed and utilized ANCs; whether mothers that delivered at home were attended by trained TBAs; and whether mothers know how to hygienically care the umbilical cords of their newborn children.

The information discovered from this study is expected to directly support healthcare providers professional practice and allow for practical application to create awareness about the importance of ANCs, underscore the need for pregnant mothers to utilize ANCs and deliver in hospitals if possible, and underscore the need for government and policy makers to train additional health professionals as well as make adequate provision for health facilities that would render ANC services especially to the hard-to-reach underserved communities. From the findings, I expect to suggest to policy makers the need to share knowledge and borrow strategies from other countries that hitherto had NNT, but achieved elimination. Also, I expect to underscore the need for government to build capacity of the TBAs for safe home deliveries and hygienic handling the umbilical cord of newborns.

The results of this study is expected to assist the Nigerian government and policy-makers to strategize and ensure that women within the reproductive age group get

vaccinated against tetanus so that their unborn children would get passive immunity against NNT. Additionally, the results of this study is expected to commit political leaders and influential people within the various communities to participate in immunization campaigns to clear the misconceptions that mothers have against tetanus toxoid vaccine and to increase ownership of the program.

The result of this study expects to strengthen the knowledge base in health care related academia, and influence/promote social change in the community by improving the health of pregnant mothers and newborns through the reduction of MNT. The outcome is expected to guide health care policy makers and immunization program managers about ways to improve maternal and newborn health care services, to improve the health indicators of Nigeria, and help the country gain NNT elimination certification within the stipulated time frame.

Summary

There is a need for the Nigerian government to show increase determination towards adhering to the WHO standard approaches for the elimination of NNT in the country. Although much has been achieved in this direction, the government must ensure the availability of functional quality health facilities and personnel to serve pregnant mothers and their newborns either free or at an affordable rate. Thus, adhering to the outlined global NNT elimination strategy must be the cardinal objective of the Nigerian government i.e., sustained routine immunization, sustained outreach immunization services, improve NNT disease surveillance, create awareness among parents on the importance of ANC services, and promoting clean, safe deliveries of pregnant mothers.

Chapter 2 provides the theoretical underpinnings of existing literature centered on neonatal tetanus, the challenges and factors associated with neonatal tetanus, role of ANC and tetanus toxoid vaccination towards the control of NNT, assess the practice of antenatal clinic visits by pregnant mothers in Nigeria, and the success recorded towards NNT elimination both in Nigeria and across the globe.

Chapter 3 presents the selected method and design in the analysis of the existing NNT data. In addition to discussing the details and rationale of the research method, the chapter includes the descriptive analysis of the problems, sources of data for the study, and also limitations/delimitations of the research methodology.

Chapter 4 presents the results of the study along with a description of the data collected and the data analysis procedures. Chapter 5 presents the interpretation of the findings, limitations of the study, recommendations as a result of the stated findings, a discussion on the implications and potential impact for positive social change, recommendation for practice, and conclusions.

Chapter 2: Literature Review

Introduction

The purpose of this study was to establish the prevalence of NNT in northeast region of Nigeria, and to ascertain if there is any significant difference in frequency of ANC, trained TBAs, and umbilical cord treatments, so as to know reasons for Nigeria's failure to meet the deadline of the global NNT elimination strategic plan.

In this study, review of literature aims to investigate current peer-reviewed articles that relate to neonatal tetanus, issues with availability and viability of vaccines against tetanus in the health facilities (i.e., TT vaccine), vaccination of women within childbearing age with the TT, access to ANC services by pregnant mothers, assess sensitivity of the neonatal tetanus surveillance system, and the performance of Nigeria's health care system. In this chapter, there are discussions on neonatal tetanus, tetanus toxoid vaccination, vaccine stock-out, Nigeria's health system, neonatal tetanus surveillance system, the theoretical framework selected for this study and historical perspective of the theory, TRA and TPB, the theoretical construct, the conceptual framework, external variables, and the socioeconomic status of mothers as social determinants of health. I discuss the conceptual framework for this study and its association attendance of ANC services and neonatal tetanus based on various studies conducted both in Nigeria and other populations. I conclude with an explanation on the importance of adherence to ANC services and completing the tetanus toxoid vaccination regimen by all women of childbearing age group to protect the newborn from NNT.

Literature Search Strategy

In the course of this study, searches for literature related to the topic were conducted through various electronic databases such as PUBMED, Medline, EBSCO, Africa journal online, CINAHL for scientific journals for nursing and allied subjects, Health Source on Nursing/Academic Edition for literature and journals with a focus on medical disciplines, Medscape for subjects on health sciences, and other Health and Psychological databases for measurement instruments used to assess knowledge in health and behavioral sciences. I searched for peer-reviewed scholarly scientific articles and psychological literature using Google search engine, PsycINFO and PscyARTICLES. Additionally, publications that relate to this study were accessed from the websites of some international organizations such as the WHO, UNICEF, USAID, UNFPA, UNDP, MDG, and GAVI. Furthermore, lists of references from original research publications and reports were also reviewed.

The list of search terms used in the literature search includes *neonatal tetanus*, *Nigeria*, *theory for planned behavior, antenatal care services, women's education on health care, neonatal mortality, maternal mortality, and access to health care in the developing countries*. Additional sources of articles obtained and reviewed for this study were electronically from professional journals.

Neonatal Tetanus

The neonatal tetanus (NNT) is a bacterial disease caused by clostridium tetani that are found especially in soil, dust and animal faeces. This disease of the newborn, which is grossly underreported in the developing countries, is preventable by administering

minimum of two doses of the TT. The neonatal tetanus is one of the most underreported diseases in the developing countries seen in the newborn within the first 28 days of life. The disease NNT, which has a high case fatality rate of between 70% to 100%, is considered as one of the leading causes of deaths among neonates in the developing countries with about 130,000 neonatal deaths recorded in 2004 (WHO, 2004; Roper, Vandelaer, and Gasse, 2007; CDC, 2012).

The disease occurs within the first 4-14 days of birth (average of 7 days) when an unimmunized pregnant mother gave birth to an unprotected child through unhygienic birth practices (CDC, 2012). The unhygienic birth practices include delivery of a newborn by an untrained and unskilled traditional birth attendant (TBA), delivery through unsanitary conditions, cutting the umbilical cord with unsterilized or contaminated sharp instruments (such as scissors, kitchen knife, blade), and dressing of the cord with a cow dung, ghee/surma or charcoal (UNICEF, 2014; Blencowe et al., 2010; Afshar et al., 2011; Zafar, Rasheed, & Abdulghaffar, 2012; Sani, Galadima, Ameh, Kawo, and Kurawa, 2010).

The clinical signs and symptoms of the NNT can start manifesting as early as the 3rd and up to the 28th day after delivery. Often the history is that an apparently healthy newborn that hitherto sucks the breast suddenly stopped sucking. The picture of a child is that of a progressively more rigid newborn, with painful convulsions and arching of the whole body. However, some of the NNT cases do not have a classical presentation but rather the symptoms are atypical with mothers having difficulties in recognizing it and

eventually go unreported (UNICEF, 2014; Blencowe et al., 2010; Afshar et al., 2011; CDC, 2012).

The bed-rock of treatment for this disease in addition to good nursing care of a newborn child in a specialized health centre is the use of antitetanus serum, intravenous penicillin, anti-convulsions, open dressing of the umbilical cord, sedation and avoidance of stimulants that trigger spasms, and use of supplemental oxygen for the child to breathe (CDC, 2012).

In a systematic review by Khan, Zahidie, & Rabbani (2013), it was observed that vaccination of pregnant women with the tetanus toxoid vaccine is one most important intervention towards reducing mortality due to neonatal tetanus in both low and middle-income countries. Additionally, there is the need for regular and effective antenatal checkups by pregnant mothers and clean delivery practices.

In a study conducted on NNT in a tertiary health centre in northeastern Nigeria, NNT accounted for a significant cause of neonatal morbidity and mortality with a prevalence of 4.9% and a case fatality rate of 66.7% (Alhaji et al., 2013). The unacceptable high prevalence and mortality in a tertiary health centre could be related to poor immunization coverage of mothers as only 9.8% of the mother of NNT children had full immunization. As shown in other similar studies, other factors to the high prevalence include harmful cultural practices of caring for the umbilical cord such as hot fomentation, application of charcoal amongst others (Ambe, Bello, Yahya, & Omotara, 2009; Abhulimhen-Ihoha, Ofili, & Ibadin, 2011; Abdulkarim, Ibrahim, Fawi, Adebayo,

& Johnson, 2011). Table 2 shows the number of reported NNT cases across the globe between 1994 and 2000 (WHO, 2004; WHO, 2008).

Table 2

Number of Reported Cases of NNT Across the Globe Between 1994 and 2000 (WHO, 2001)

Year	NNT cases/1,000 population
1994	3,984
1995	2,071
1996	3,348
1997	3,207
1998	4,721
1999	3,883
2000	5,173

As mentioned earlier, the NNT can be prevented by creating awareness among women to understand more about NNT and vaccination's benefit, universal vaccination of women within the childbearing age group using the tetanus toxoid vaccine as well as promotion of clean delivery services and cord care practices (WHO, 2008). To achieve this, all countries have standard immunization schedules for mothers within the childbearing period. To confer protection of the mothers and their newborn children against MNT, pregnant women are expected to get the first two doses of the TT within an interval of four weeks, and the third dose two weeks prior to birth. Considering the importance of adherence to completion of the TT schedule after delivery, there is a need for at-risk mothers to be identified for this as well as to ensure that their newborn babies also receive good post-natal care (Oyedeji, Fadero, Joel-Medewase, Elemile, & Oyedeji, 2012).

The need to promote hospital delivery and adherence to clean delivery practices using trained TBAs, where hospital is lacking, must be observed both during delivery and umbilical cord care (Akani, Nte, & Oruamabo, 2004; Sani et al., 2010). It is advisable that women within their childbearing age should get not less than five total doses of the TT vaccine in line with the EPI immunization schedule (WHO, 2008; UNICEF, WHO, & UNFPA, 2000) and get lifelong immunity against tetanus infection. Attention should be given to especially women in the rural settings that have not been reached by immunization services.

Alhaji et al. (2013) in a retrospective study in a tertiary health centre in northeast Nigeria observed that more male neonates had NNT than female, and attributed this to a high preference for a male child by parents resulting in prompt seeking for medical attention. The authors also noted that a high number of the neonates with NNT were delivered at home, had their umbilical cords cared in an unhygienic way, and the mothers were of poor socio-economic status. However, all these factors are considered as risk factors to NNT.

Tetanus Toxoid Vaccination

Although modern vaccine development started over 200 years ago, it was in 1789 when Edward Jenner first developed the smallpox vaccine leading to the historical eradication of the smallpox disease in1980 (Andre, 2003; Brown, 1999). However, there are several vaccines developed by renowned scientists whose excellent contributions remarkably resulted in the control and spread of other life-threatening infectious diseases. Thus, the emergence of vaccines has had a more positive impact in reducing morbidity

and mortality across the globe from emerging and re-emerging infectious diseases. Thus, immunization is one of the most cost-effective ways of controlling infectious diseases, reduce maternal, infant and neonatal death rates to improve the health indices across the globe.

The tetanus toxoid vaccine (TT) was first produced in 1924 and successfully used during the Second World War to treat as well as prevent tetanus. The TT vaccine is prepared by inactivating the tetanus toxin to toxoid form using formalin. To the toxoid formulation is then added aluminum phosphate to change it into an adsorbed form (CDC, 2012). The TT comes in different designs and doses; it is given to pregnant mothers as well as women of childbearing age to protect them and their newborn children against maternal and neonatal tetanus (MNT). The TT is also given to individuals who sustained open injuries as a prophylaxis to tetanus infection.

Furthermore, in mid-1940s, to the tetanus toxoid vaccine was added two other antigens that protect the infant against diphtheria and pertussis giving rise to the DTP vaccine (CDC, 2012). In the 21st century, two additional antigens (Hepatitis B and Haemophilus influenza type b vaccines) were added to give rise to pentavalent vaccine. The DPT, which is still in use, in some countries, as well as the pentavalent vaccines, are given to eligible children within their first year of life to protect them against some of the childhood vaccine preventable diseases in accordance with EPI immunization schedules. However, the standard EPI regimen for the DTP or pentavalent vaccines is three doses to be given at 6, 10, and 14 weeks of life (WHO, 2008; WHO, 2014; WHO, 2005).

The effectiveness of the vaccines is dependent on effective the cold chain system to preserve them within the required temperature. Thus, adequate cold chain equipments are important requirements in preserving the viability and potency of the tetanus toxoid vaccine. The TT vaccine should be refrigerated within the temperature range of 2 and 8 degrees Celsius and be given intramuscularly at room temperature. The storage temperature for the vaccine should not go outside the standard range to avoid compromising the potency of the TT vaccine (WHO, 2008; WHO, 2014; WHO, 2005). It is only when an individual gets vaccinated with a potent viable TT vaccine that the immune system produces antibodies to protect the body against the tetanus bacteria. However, the minimum required dose that enables the human system to produce the minimum required antibodies for protection against the tetanus bacteria is two vaccine doses. The immunized mother then gives passive immunity against tetanus to her unborn child that will eventually protect him against NNT within the first six weeks of life. However, completion of the DTP or pentavalent vaccine regimen that is given at 6, 10, and 14 weeks of life gives further protection to the child. Table 3 shows the immunization schedules for children under the age of one year (WHO, 2005, 2008, 2014).

Table 3

Tetanus Toxoid Immunization Guidelines for Women Immunized During their Childhood[a]

Age at last vaccination	Previous immunizations	Recommended immunizations	
		At present contact/pregnancy	Later (at intervals of at least one year)
Infancy	3 DTP	2 doses of TT/Td (min.4 weeks interval between doses)	1 dose of TT/Td
Childhood	4 DTP	1 dose of TT/Td	1 dose of TT/Td
School age	3 DTP + 1 DT/Td	1 dose of TT/Td	1 dose of TT/Td
School age	4 DTP + 1 DT/Td	1 dose of TT/Td	None
Adolescence	4 DTP + 1 DT at 4-6 yrs + 1 TT/Td at 14-16 yrs	None	None

aMaternal immunization against tetanus. Standards for Maternal and Neonatal Care Steering Committee Report (WHO, 2006).

The pregnant woman gets three doses of the TT vaccine during her antenatal visits, then the fourth and fifth doses within two years after delivery or during her next pregnancy to give her life long immunity such that she would continue to give passive immunity against NNT to her subsequent newborn children (WHO, 2014; UNICEF, 2014; WHO, 2005). The doses given to the mother should be recorded in a standard tetanus toxoid immunization register as well as maternal immunization card. Table 4 shows the immunization schedules for pregnant mothers (WHO, 2005, 2006).

Table 4

Tetanus Toxoid Immunization Schedule for Women of Childbearing Age and Pregnant Women with no Previous Exposure to TT, Td or DTP[b]

Dose of TT or Td (according to card or history)	When to give	Expected duration of protection
1	At first contact or as early as possible in pregnancy	None
2	At least 4 weeks after TT1	1-3 years
3	At least 6 months after TT2 or during subsequent pregnancy	At least 5 years
4	At least 1 year after TT3 or during subsequent pregnancy	At least 10 years
5	At least 1 year after TT4 or during subsequent pregnancy	For all childbearing age years and possibly longer

[b]Maternal immunization against tetanus. Standards for Maternal and Neonatal Care Steering Committee Report (WHO, 2006).

In a situation where a case of NNT is obtained from an immunized mother, a dose of the TT vaccine must immediately be given to the mother as well as response immunization is carried out among other nonimmunized women in the community, and other doses be completed accordingly. In this case, the mother and the other unimmunized women should get a second dose at least four weeks thereafter, and third dose at least six months after the second dose (WHO, 2005, 2014; UNICEF, 2014).

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 (Akani et al., 2004; Sani et al., 2010). 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 (Akani et al., 2004; Sani et al., 2010). The importance of tetanus toxoid in the prevention of maternal and neonatal tetanus is clear (Blencowe et al., 2010), hence the need to make women understand NNT as a disease and the benefits of the tetanus toxoid vaccine in its prevention. This requires the need to understand the beliefs of women on the outcomes of getting tetanus toxoid vaccination, their attitude towards the tetanus toxoid vaccine, their normative beliefs, as well as their control beliefs.

Vaccine Stock-Out

In Nigeria, especially the northern region, there are several instances that mothers attend ANC centres or take their newborn for routine immunization without getting vaccinated due to either lack of functional refrigerator to store viable vaccines, vaccine stock-out, lack of electricity supply to power the aging cold chain equipment, or lack of health care worker to attend to these mothers who came from far often on foot to access these services (WHO, 2005).

The two elements considered essential to EPI operations are cold chain and logistics to effectively to address the issues of vaccine stock-out and shortages of other supplies that include syringes and cold chain equipment. The cold chain and logistics are key towards ensuring that vaccines, cold chain equipment, and other supplies meet the needs of the targeted group at all levels. Although there are adequate quantities of in-date potent vaccines at all levels especially in the developed countries, this is not always the case in most developing countries with Nigeria as an example. It has been shown that

there is an estimated over 130 million doses of vaccine that are delivered annually, these supplies could only reach 50-80% of the 25 million under-one children in the 46 countries (WHO, 2005).

In an attempt to address the issue of logistical supplies, the WHO conducted training sessions for logisticians in 1999 and 2000 from each of the 36 countries with Nigeria in attendance. It is overwhelming to note that the trained staff are rarely given the task of the entire logistics function. Often the national logisticians performed less than half of the 15 essential tasks of a logistics manager. Furthermore, the failure to routinely manage logistics operations is as a result of lack of coordination thus crippling distribution and handling of the vaccines, transportation as well as the safe administration of the vaccines (WHO, 2005).

The other important element is the quality of the cold chain system. It is on record that the cold chain equipment has reached their aging lifetime and hence the need for replacement with new functional equipment. Several studies indicated that one of the main reasons for the low coverage seen in several areas is as a result of lack of transportation; this adversely affects achieving the minimum coverage as well as disease reduction targets. These problems are more commonly seen in the northern Nigeria and especially the northeast region because of the terrain and a large number of hard-to-reach settlements (WHO, 2005).

The EPI program requirements include timely delivery of supplies of heat labile vaccines for the conduct of outreach immunization sessions in the rural areas and active surveillance of vaccine preventable diseases such as the NNT. These factors contribute to

the repeated vaccine stock-out in the health facilities in the rural areas, discouraging mothers from accessing the epileptic immunization/antenatal service that is provided once or twice in a week. The negative effect of this is that mothers would not get the minimum required tetanus toxoid vaccination to protect them and their unborn children against the tetanus bacteria; this puts the mother and the unborn child at the risk of developing MNT (WHO, 2005).

Nigeria's Health System

Despite the strategic role that Nigeria play on the African continent, and the April 2014 statistical "rebasing" exercise that placed Nigeria as Africa's largest economy because of its 2013 GDP estimated at US$ 502 billion (CIA, 2014), the Nigerian government has failed to uphold the goals of the universal basic primary health care; this made the healthcare system operating below the minimum expected standard. The health care sector in Nigeria has suffered gross neglect for decades, the resultant effect of which is a lack of functional health facilities, lack of qualified personnel, lack of diagnostic medical equipments to mention but a few; these problems are even worse in the rural areas (Osain, 2011). However, the problems are more pronounced in the public health sector where there is a lack of timely information to combat infectious and communicable diseases, inadequate tracking of disease outbreaks to adequately treat and preventive further spread, poor surveillance and infectious disease tracking procedures; the adverse of all these would be health insecurity potentially endangering our security as a nation (Osain, 2011).

Although successive governments have embarked on several reforms towards addressing the wide range of issues in the epileptic health sector, much of these are yet to be implemented especially at the state and the local governments. The government has failed to create a health care system that would information-rich and patient-focused to reliably deliver high-quality care to its citizenry (Osain, 2011).

The Nigerian government, in its effort to save the deteriorating health sector from total collapse, held a national health conference in 2009. The outcome of the conference underscored the fact that the health care system is decaying, and the quality of care is sub-standard. Factors to this include lack of coordination on how health care programmes are executed, disintegration of the services, scarcity of resources, stock-out of vaccines, essential drugs and other hospital consumables, inadequate infrastructure, imbalance on allocation of resource, and non-functioning primary health care in the rural areas. The causes to these problems include corruption in a top-bottom manner, and lack of clarity on roles and responsibilities at different levels of government (Osain, 2011).

The Nigeria's health sector, despite decentralization of activities as part of the health reforms, is not serving the populace especially those down the social ladder. Some of the reasons for this include competing health priorities, insecurity, and deterioration in the socioeconomic aspect of life across Nigeria. The resultant effect of this is high attrition rates of health personnel because of poor motivation, and lack of capacity building especially in immunization. In line with the EPI objectives of eliminating VPDs in Nigeria through building up of population immunity, there is a need to strengthen capacities of health workers that will support quality immunization service delivery at the

various health facilities. The capacity building should be targeted at ensuring strengthening of capacity to cope up with the immunization challenges, accelerated disease control and the introduction of new vaccines amongst other innovations. Furthermore, there is a need to recruit additional health workers at the various health facilities to serve the hard-to-reach areas who need the immunization service most and where cases of NNT are seen (WHO, 2005) especially.

Neonatal Tetanus Surveillance System

This is the process of systematic collection and evaluation of relevant data with timely communication of the results to relevant authorities for prompt action. NNT surveillance is an important tool in the global NNT elimination game plan. Although the surveillance for NNT cases operates in various ways, the ones in use include active surveillance, passive surveillance, case-based surveillance, community surveillance, and epidemiological surveillance (WHO, n.d.).

The case-based surveillance, which Nigeria started in 2007, is done through collection of specific data on each suspected NNT case reported. Other recommended NNT surveillance in the current global elimination strategy include active surveillance conducted in major health facilities on a regular basis (and at least once a year); community surveillance conducted in silent areas when routine reporting is not functional but where based on other indicators NNT poses a problem); passive surveillance is conducted by looking for NNT cases from records of health facilities, and epidemiological surveillance in which high-risk areas are identified so as to monitor the impact of interventions. Furthermore, all hospital-reported NNT cases are considered as a

confirmed case since diagnosis is purely clinical and do not depend upon laboratory or bacteriological confirmation. Still, as part of the surveillance, the number of confirmed NNT cases which must be routinely reported in the monthly surveillance reports of all countries must be separated from other non-neonatal tetanus cases. As part of the strategy, it is paramount also to underscore the fact that zero reporting of NNT cases is required at all levels. However, in low risk geographical areas (incidence<1/1,000 live births with effective surveillance), any suspected case should be investigated to confirm the case and identify the cause (WHO, n.d.).

In a study conducted by Onalo, Ishiaku, & Ogala (2011) on prevalence and outcome of neonatal tetanus in Zaria, the authors observed a decline in the incidence and the mortality rate of neonatal tetanus; they concluded that if the ongoing global efforts is sustained, NNT elimination in Nigeria will also be a reality.

Theoretical Foundation

The theoretical framework considered in this research was the TPB, a modified model of the TRA that was meant to be applied to the prediction of purely volitional behaviors, and to help understand psychological determinants of individuals (Ajzen & Fishbein, 1980). The TRA assumes human beings that behave in a rational manner also make systematic use of the information within their reach. The TRA also observes that most of the actions of subjects are built on volitional behaviors; thus suggesting that the intention of a person on performing or not performing a certain behavior determines his action. It implies that an individual's intention depends on two essential determinants: the first is an attitude towards individual's behavior, which is vital in the evaluation of

positive or negative attributes of the individual in performing the behavior; the second determinant is the perception of the social pressures on the person on performing or not to performing the behavior under study (Ajzen & Fishbein, 1980).

Historical Perspective of the Theory of Planned Behavior

In 1985, the TRA was later expanded to TPB with the addition of the concept of perceived behavioral control (Ajzen, 1988). The expansion was because of the observation that many behaviors are not under complete volitional control (Ajzen, 1988). The TPB aims to address some of the inadequacies of the TRA especially when dealing with uncompleted volitional control (Ajzen, 1985). Thus, the emergence of TPB serves as a means of providing a framework that is better in understanding actions of the subjects more than the TRA. Additionally, the TRA/TPB highlights individual motivational factors that are considered key elements to the likelihood of performing an exact behavior focusing on the theoretical concepts (Glanz et al., 2008). Additionally, the TRA/TPB can predict the number of different health related behaviors to explain the variance in behavioral intention, and can also explain individual's social behavior using "social norm" as a variable.

The Theory of Planned Behavior

The TPB significantly emphasizes on how behavioral intention of humans can be carried out. TPB helps researchers to understand the distinction between what an individual intends to do and what the individual will do. It is often, expected that people will perform a particular behavior when they plan to attempt once again more especially when they believe to have control over it; this is notwithstanding the fact that behavioral

intentions and expectations could differ based on the situation. Furthermore, the behavioral intentions of humans do change upon realizing that they do not entirely have the volitional control of their behavioral goal. Additionally, the actual behavior of individuals could be predicted more accurately based on their behavioral expectations better than their behavioral intentions (Ajzen & Fishbein, 1980).

Thus, both the TRA and TPB entails that the decision of each to perform a particular behavior is grounded on information available from external and internal sources. Accordingly, TPB shows that the intention of human beings to perform a particular behavior and the conduct of that behavior are determined by three independent constructs that are based on belief structures: attitude toward the behavior, perceived behavioral control, and subjective norms to perform the behavior (Glanz et al., 2008). These behavioral determinants are based on three belief structures, namely: behavioral beliefs, normative beliefs, and perceived beliefs. The behavioral beliefs are beliefs on the behavioral outcome as well as the outcome evaluations; the normative beliefs are concerned with the normative expectations of others, and the approval/disapproval on the behavioral performance, and perceived beliefs are concerned with the perceived factors, which impact on the easiness or difficulty of the performance of the behavior (Glanz et al., 2008).

Attitude to Behavior

The first determinant of behavioral intention of an individual is the attitude. As observed by Moan (2005), the measure of attitude also determined by behavioral beliefs, can be done using perceived positive as well as negative of performance of a particular

behavior. It underscores the fact that when an individual feels that the outcome of performing a particular behavior will turn out to be positive, the person will have a positive attitude towards performing that behavior. Ajzen & Fishbein (1980) added that if an individual feels that performing a certain behavior will turn out to be negative, the person will state the negative behavior that comes with that action.

Additionally, the behavioral attempt of an individual is dependent on the several factors that include personal and external; this could influence control over a person's behavior. Thus, it is clear that using TPB, the determinants of an individual's attitude towards performing the behavior is different; an example to this is that the attitude of a person towards behavioral trial and success often differs from the attitudes towards behavioral trial and failure. However, respective and subjective probabilities of the events could be used to weight these ideas. Once again, attitude towards the success and failure of behavioral attempts could also serve as the determinant of the beliefs of individuals. Hence, attitude could be regarded as a function of significant beliefs vis-à-vis the probable effects of success or failure in the behavioral performance. In absolute terms, and where success is discreetly assumed, these beliefs are more to do with performing a volitional behavior. In contrast, these beliefs are unlikely when looking at a person's thoughts; this is more so when the behavior is seen as failed performing volition (Ajzen & Fishbein, 1980).

Subjective Norm

This is the second determinant of a person behavioral intention. As highlighted by Glanz et al. (2008), subjective norm is considered an individual's perception of getting

approval or disapproval in the performance of behavioral intention. Importantly, subjective norm is determined by the individual's normative beliefs concerning a perceived social pressure from significant others; this motivates the behavior of an individual to be able to meet the expectations of the significant others. Additionally, if the significant others perceive a certain behavior to be negative, then the individual would state a negative subjective norm, in an effort to achieve their anticipations (Glanz et al., 2008).

In the subjective norm, there is a need to underscore the fact that the referent factor is vital as it is serves as recommending an effort for people to approve the behavior and believe on the likelihood of succeeding the effort (Glanz et al., 2008). Also, attempts to understand the determinants of subjective norm would require a person to elicit salient normative beliefs, which regards specific referents; this multiplies the behavior of a person with the corresponding motivation to comply with it (Glanz et al., 2008).

Perceived Behavioral Control

This is the third determinant of the TPB. The concept of perceived behavioral control denotes appraisals of people's ability to perform behavior (Ajzen, 1988). This construct aims to predict not behavioral intention but also when the perceptions of control by people correctly matches their control over the behavior. Thus, this should reflect the person's actual performance of the behavior. The perceived behavioral control reflects the actual behavioral control of a person. Additionally, perceived behavioral control is also underlined by control beliefs of factors (external or internal), which may inhibit or smoothen performance of the behavior; these factors include perceptions of barriers,

inhibitions, talents, resources, and opportunities (Ajzen, 1988; Ribera, D'Alessandro, & Grietens, 2007). The perceived behavioral control also serves as part of the beliefs of individuals regarding the difficulty or easiness of performing a behavior (Glanz et al., 2008).

As highlighted by Ajzen (1991), people are more likely to perceive a high degree of behavioral control when they perceive they have access to the essential resources and opportunities with no obstacles towards performing the behavior. It was observed that its perceived power weights each control factor in facilitating or inhibiting performance of the behavior by a person; this shows that perceived control often work in tandem with behavioral performance. However, this perception gets stronger when the perceived control tallies with a good reason for the actual control (Glanz et al., 2008).

The need for people work on "self-efficacy" will support assessing the relationships of perceived control and behavioral performance towards overcoming certain phobias or strong habits (Bandura, 1982). Although there are differing views on evaluating the power of factors that could facilitate or inhibit performance of the behavior, this should be weighted by the frequency of their occurrence (Ajzen, 1991; Ajzen & Driver, 1991). However, other researchers suggested that both constructs should be measured and that there is a need to distinguish perceived control over behavior (that is a variant of perceived behavioral control) from perceived confidence in one's own ability to perform the behavior (i.e. self-efficacy) (Armitage & Conner, 2001).

The TPB considers the influence of the past behavior on present behavioral performance. The past behavioral performance of a person often has an influence on the

present; this is independent of these constructs (behavioral intentions, attitudes, subjective norms, or perceived behavioral control). The past behavioral performance has an effect on the present behavior especially when somebody has complete control and deals with a volitional behavior (Glanz et al., 2008).

Relating Theoretical Framework With the Study

The TPB as a theoretical framework has been used to predict a number of different human behaviors. Through the use of three predictors (attitude, subjective norm and perceived behavioral control), the TPB shows that the determinant of human behavior is the intention to perform the behavior (Glanz et al., 2008). Applying TPB to the predictive model of NNT, there are various determinants of preventive behavioral intention among the women towards NNT. The beliefs of pregnant women on the outcomes of their pregnancies after they attend ANC, receiving tetanus toxoid vaccination and delivering in a hospital setting are all dependent on how the women value these which also determine their attitudes toward receiving a tetanus toxoid vaccine to prevent their unborn child from the NNT. Furthermore, the belief of women about their significant others also forms the subjective norms of women towards receiving the tetanus vaccination to serve as a means of protecting them as well as their unborn children. Additionally, the beliefs of a woman under the external and internal factors on whether to perform behavioral success forms the basis of the woman's perceived behavioral control regarding getting vaccinated with the tetanus toxoid to prevent them and their unborn children from the NNT.

In a research study by Conner and Sparks (2001) that assesses the perceived behavioral control vis-à-vis predictive intention and behavior in people, the authors observed that to predict perception of control has significant contribution to intention towards reducing high risk behaviors. Additionally, Conner and Sparks also found that not all behaviors of humans that respond to certain actions that could be influenced by perceived behavioral control; this is because the behaviors of humans could occasionally be in the form "incomplete volitional control." Thus, applying TPB could help explain that the point that, through internal or external control factors, people could be faced with difficulties or feel ease to perform the behavior; this calls for the need to assess how perceived behavioral control is related to specific problems (Ajzen, 1988).

The TPB enable researchers understand their beliefs on the outcome of the pregnancies when they get vaccinated with tetanus toxoid during antenatal clinic visits; how they value getting vaccinated with the tetanus toxoid; and their attitudes towards vaccination with tetanus toxoid in preventing them and their unborn children from NNT. This theoretical framework would help to build a framework that would help ascertain key behavioral, normative, and control beliefs that affect behaviors; this would again help to design interventions that target women of childbearing age to change their beliefs on ANC and tetanus toxoid vaccine. It also helps to affect their attitude, subjective norm, or perceived control that changes their intentions and behaviors (Glanz et al., 2008).

Theoretical Constructs

In TPB, the three main theoretical constructs that act through a causal chain linking behavioral beliefs, normative beliefs, and control beliefs to behavioral intentions and behaviors are attitudes, subjective norms, and perceived control (Ajzen, 1991).

The role of women in a societal context as related to getting vaccinated with the tetanus toxoid to prevent NNT is that they are seen as a mother to the children, and wife as well as a household keeper to her husband. So, women are considered the backbone of every family circle. The contribution of women does not end at that, but they also contribute towards the upkeep of the family through some little income from trading, fetching water to cook for the family, washing her husband's clothes, as well as farming especially in some rural communities (Kalaca et al., 2004). It is not surprising to see that the role of a woman changes based on the cultural norms. In spite the wind of social change blowing across the globe, the actual power in the family rests in the hands of the husband taking final decisions on issues that affect the family. Furthermore, women especially in the African culture are dependent on their husbands as they have little opportunity to study western education as men; this contributes to their lack of knowledge on issues that relate prevention and control of diseases (Kalaca et al., 2004; Taneerananon, 2005).

In the developing countries especially the sub-Saharan African region, decision on health matters is the responsibility of the husband and not the wife thus putting some social constraints on a woman. The decision to visit the hospital when a woman is sick or to attend ANC services when pregnant is the sole responsibility of the husband thus

making it difficult for women to get tetanus toxoid vaccines to protect themselves and their unborn children (Mapatano et al., 2008). Mapatano et al. underscored the strong influence of social variables on the health behavior of women. These authors added that when women migrate to a new environment, they end up creating new social structures to suit them. Thus, when there are different social practices, the behavior of the woman changes as well.

The Intention of Women Towards Tetanus Toxoid Vaccine towards The Prevention Of NNT

The TPB construct shows that the intention of an individual is the immediate antecedent of behavior; this indicates that intentions can predict behavior. The TPB underscores the relationships amongst these constructs: belief, attitude, subjective norm, perceived behavioral control, and behavioral intention; these are very distinct in comparison to those factors, which determine the possibility of conceding the behavioral intention. Kalaca et al. (2004) conducted a study in Istanbul, the capital of Turkey, and the outcome showed that 94(94.9%) of the 99(100%) women plan to receive tetanus toxoid vaccination in their next pregnancies; this is indeed a remarkably high number of women, which hitherto was not the case. However, the intention of these women was to prevent their newborn from getting NNT.

The Attitude of Women Towards Tetanus Toxoid Vaccine towards The Prevention Of NNT

The attitude of women towards having the tetanus toxoid vaccine to prevent their newborn from the NNT is a representation of their orientation towards the behavior as

well as their readiness in responding to the behavior on getting the tetanus toxoid vaccine as a means of preventing their newborn children against the NNT. It is clear that there are different theoretical constructs through which attitude is measured. Using the TPB, attitude could be measured by combining outcome beliefs, outcome evaluation as well as perceived outcomes of the performance of a specific behavior whether positive or negative (Mapatano et al., 2008).

Perceived negative outcome of vaccination with tetanus toxoid to prevent the newborn from tetanus.

There are several literatures that show women refusing to get the tetanus toxoid vaccination because of their negative perception that the vaccine has some associated risks for their unborn child. In a study by Brent (2005) that involved 1,176 clinically recognized pregnancies, the author noted that nearly 176 would result in miscarriages and that in the remaining 1,000 live births, 30–60 (3–6%) would have congenital anomalies. This could explain the negative perception of the several women from the rural areas that the tetanus toxoid vaccination is the cause of their miscarriages. This explains some of the difficulties in having a positive attitude among some of these women to get the tetanus toxoid and protect their unborn children from the NNT.

As observed by Gellin et al. (2000), women with fear against vaccine preventable diseases often get vaccinated, while women that have negative feelings about vaccine safety are unlikely to get vaccinated.

Although there is no available literature to highlight that there are occasions when despite a mother completing the tetanus toxoid vaccination course, a newborn child

develops NNT. The reason behind this is that the tetanus toxoid given to the mother was not potent enough to make her develop immunity against the tetanus bacteria. There are lack adequate cold chain equipments in especially the rural areas to maintain viability of the vaccines within the required temperature. Where these equipments are available, there is no stable electricity supply or sufficient resources to power the generators for the refrigerators to preserve the vaccines. The resultant negative effect of this situation is women having a mistrust about the tetanus toxoid vaccine and further compounding the problems of NNT.

Furthermore, some pregnant mothers have fear on the vaccine side effects as a means of population control by rendering them infertile; the resultant negative effect of this mothers refusing the tetanus toxoid vaccines and further spreading rumors that tetanus toxoid vaccination would render the population infertile. Ironically, this phobia is more pronounced in women who are sub-fertile or have secondary infertility. Also, the method of the health promotion campaigns employed during some of these programs sometimes adds to these negative attitudes (Brown et al., 2011).

Other reasons for women refusing the tetanus toxoid vaccines are the immediate side effects such as soreness and pains at the injection site, anaphylactic reactions though rare but could be fatal (Foley & Kopelman, 1995). These side effects could also be considered as barriers linking attitudes to getting vaccinated with the tetanus toxoid vaccine prevent NNT.

Perceived benefit of vaccination with tetanus toxoid as a means of prevention of NNT

There is no doubt that the tetanus toxoid vaccine has saved the lives of millions of newborns across the globe since the commencement of the global NNT elimination game plan (Roper et al., 2007). It was estimated that between 1995 and 1996 in across 320 of the 560 countries, there was an estimated coverage of 80% (with at least two doses) of the tetanus toxoid vaccines in about 23 million women aged 18–35 especially in the developed countries (Roper et al., 2007; Chai et al., 2004; Maral et al., 2001). The extensive tetanus toxoid vaccination coverage that saved the lives of millions has resulted in a positive attitude of women towards their behavior to have the tetanus vaccine as a means of prevention against NNT.

Furthermore, it is a government policy that tetanus toxoid is administered freely to all women of childbearing age; this also makes women develop the habit to perform behavioral intention towards getting vaccinated with the tetanus toxoid against the NNT.

The Subjective Norm of Women to Have Tetanus Vaccination to Prevent the Unborn from NNT

As assumed in the TPB, the subjective norms are a function of normative beliefs; this is the belief of a person that an individual or a group thinks whether a person should perform or not perform the behavior. This theory further showed that to an extent, subjective norms could determine intentions. On the question of existence of any relationship between behavioral intention of a woman to get vaccinated with the tetanus toxoid to protect her unborn child from disease, it is clear that women who are

approached with the information are more likely to indulge in the vaccination practice much more than those that lack the information (Mapatano et al., 2008).

It is on record that in the developing countries of especially sub-Saharan Africa, culture and illiteracy are contributing factors to women not attending ANC services to get tetanus toxoid vaccination. As a result of these cultural beliefs women, especially in the rural areas, depend on their husbands for their source of livelihood. These women, who had little or no western education, almost have no knowledge of methods of disease prevention and control; however, decisions on health matters are purely that of the husbands. Thus, the behavioral intention of these women on getting vaccinated with the tetanus toxoid to prevent their unborn children against NNT is largely dependent on their husbands and in some cases their relatives; this has great influences in the intention of these women. This was supported by a study, which showed that the intention of women to get the tetanus toxoid vaccine as a means of protecting the unborn child against NNT was an issue because their husbands told them to avoid vaccinations as it results in sterility (Bastien, 1995; Mapatano et al., 2008).

The Perceived Behavioral Control of Women to Tetanus Toxoid Vaccine to Prevent the Unborn from NNT

As highlighted in the TPB, perceived behavioral control means the degree of beliefs of an individual on how difficult or easy the person feels regarding performing the behavior. However, internal and external factors have great influence on people's ability to perform behavioral intention. As observed by Conn et al. (2003), perceived behavioral control can directly or indirectly have an impact on behavioral intentions.

There is a need to underscore the point that there are difficulties in the performance of women's behavioral intention towards the tetanus toxoid vaccination as a means of preventing NNT if they could not get adequate information from health care providers. In a study by You et al. (2007) to assess the knowledge and behaviors of women of childbearing age in relation to tetanus toxoid immunization in a rural China, the authors noted that women are unlikely to accept the tetanus toxoid vaccine if they lack the understanding of its benefits; this is because of the misconception that immunization could result in infertility or the mental status of the unborn child. The need for medical personnel to have sufficient knowledge of NNT that can be shared with mothers should not be over emphasized.

Adequate explanation on the health benefits of tetanus toxoid vaccination and the ill side of NNT directly or indirectly impact on the behavioral intention of women towards getting vaccinated with the vaccine. In the event where the health worker could not provide a convincing explanation to mothers, the resultant effect would be non-compliance with the tetanus toxoid vaccination regimen. The lack of knowledge among women on NNT, tetanus toxoid vaccine, and doses required to confer immunity to them and their newborn children against NNT also inhibits them from getting vaccinated with the right vaccine (Kalaca et al., 2003).

In the northeast Nigeria, the healthcare system in the rural areas, where greater cases of the NNT are seen, often do not render quality ANC services to the pregnant women. Reasons for this include lack of personnel, vaccine stock-out, and equipments to facilitate deliveries using aseptic procedures. In areas where these services are available,

distance by mothers who often live in hard-to-reach areas is a deterring factor. Thus, the availability, affordability, and accessibility of the ANC services are paramount to ensure that all eligible women get the minimum required doses of the tetanus toxoid vaccines. The importance of having functional health care system is key to NNT elimination and towards behavioral intention and performance of women (Emeribe & Akah 2011; Ide & Nte, 2009; Akani et al., 2004). Furthermore, lack of basic equipments in the health facilities and distance are discouraging factors to mothers from utilizing the ANC services (Emeribe & Akah 2011; Ide & Nte, 2009; Akani et al., 2004).

Generally speaking, most of the NNT cases seen in Nigeria occur in the rural areas among women who are down the social ladder. This underscores the inequity and equality that exist in Nigeria and other developing countries. The mothers of the NNT children depend on their uneducated and often unemployed husbands for their livelihood. These women, who have to cook for the family, had to walk the whole day to and from a health facility to receive ANC services. Furthermore, a pregnant mother could sometimes go to the antenatal clinic without getting the required services either due to lack of personnel or vaccine stock-out. This is one of the reasons why the women become discouraged and stop seeking for the antenatal services.

Literature shows that the women often lack adequate information on NNT, the benefits of attending antenatal clinics to get tetanus toxoid vaccination, and delivering in a hospital setting. Furthermore, these women also lack information on to care for the umbilicus of the newborn child. In an attempt to obtain behavioral intention of these women, there is a need to supply the necessary information on NNT and the advantages

of the tetanus toxoid vaccine to all eligible women. Effective communication of the right message in a simple and easy to understand way to these women is key. These should through all available channels ranging from mass media, health workers, social workers, religious groups, and influential people in the community. This would build up the knowledge of these women on NNT and tetanus vaccine to have a good perception that enables them to perform their behavioral intention (WHO, 2005; GAVI, 2001). When women have the necessary knowledge, and information on NNT and their ability to practice delivery through hygienic ways, their behavioral intention towards getting vaccinated with the tetanus toxoid vaccine tends to be improved. There are studies that indicated women with the ability to practice hygienic delivery are more likely to get the tetanus vaccine as a preventive measure towards neonatal tetanus as compared to those who did not have the ability (Celik & Hotchkiss, 2000; Idris, Gwarzo, & Shehu, 2006; Onah, Ikeako, & Iloabachie, 2006).

The Conceptual Framework

The conceptual framework that used in this study was based on TRA and TPB as outlined in Figure 1. The framework acts in a causal chain link behavioral beliefs, normative beliefs, and control beliefs to behavioral intentions and behaviors through attitudes, subjective norms, and perceived control (Ajzen, 1991).

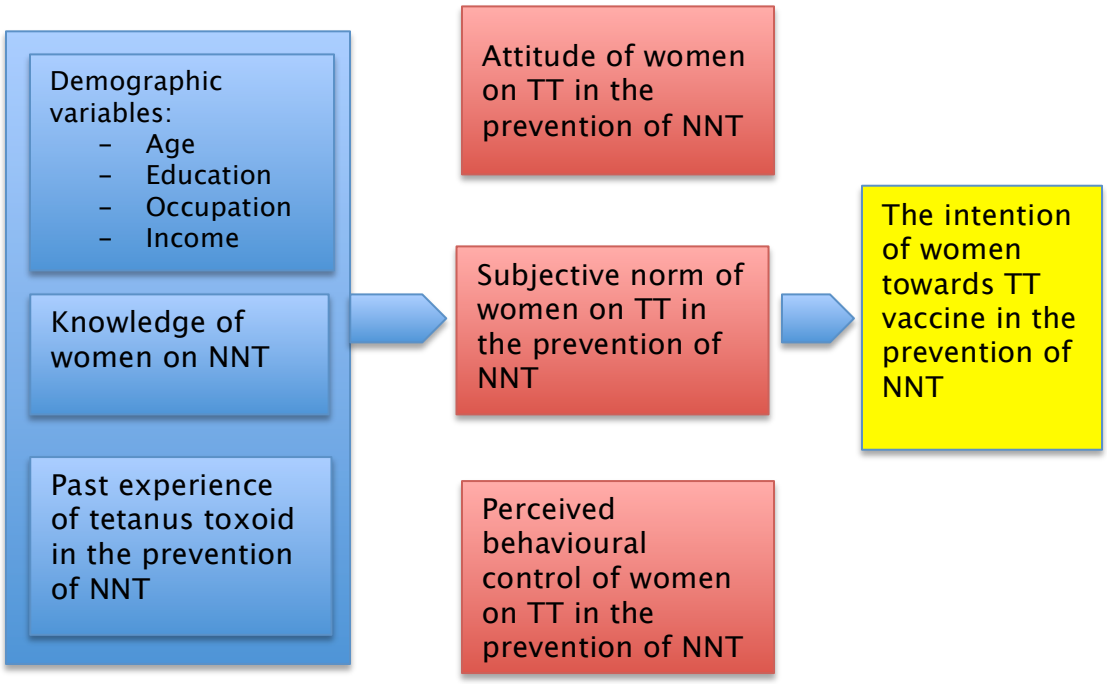

Figure 1. The conceptual framework in the prevention of NNT in women of childbearing age.

The external variables operate through model constructs without independently contributing to the likelihood of performing behavior; these variables are demographic variables, the knowledge of women on NNT, and the past experience of tetanus toxoid in the prevention of NNT.

External Variables

- Demographic

The variables considered here are, educational status, occupation and income level. It is assumed that these factors directly or indirectly have an effect on these constructs: attitude, subjective norm, perceived behavioral control, and behavioral intention of women with regards to getting vaccinated with the tetanus toxoid vaccine as a means of protection against the NNT.

Although the environment has a great role in shaping the lives of the populace, it is a fact that people from different countries have different social backgrounds, cultures, beliefs and attitudes. Thus, the attitudes, subjective norms, and perceived behavioral controls of these people on whether to get the tetanus toxoid vaccine, as a source of preventing their unborn children against NNT will also differ. The negative perception of women in the developing countries on tetanus toxoid vaccination as a preventive measure against NNT is different from their counterparts in the developed countries. In the developing countries, the attitude, subjective norm, and perceived behavioral control of the educated working class women on vaccination with tetanus toxoid are different from the uneducated non-working class parents (NDHS, 2008; WHO, 2007, 2008, 2014).

Educational status of mothers is considered a strong factor towards utilization of health care services and getting tetanus toxoid vaccination. The educated women understand better the purpose of tetanus toxoid vaccination, the possible side effects that could arise from that when compared with those who had little or no western education. This could explain the reasons why cases of NNT are more in the northeast region of Nigeria when compared with that of the other regions. The northeast region has poor educational background, low income, and employment as well. The people in this region have strong cultural beliefs when compared with their counterparts in the other regions (Elo, 1992; Adai, 2000; Celik & Hotchkiss, 2000; Idris, Gwarzo, & Shehu, 2006).

The understanding of the younger population of women on having tetanus toxoid vaccination as means of protecting the newborn from NNT is positive when compared with the older generation of women. The age of the mother at birth is inversely related to

the use of ANC to get vaccinated with the tetanus toxoid to give protection to both the mother and her unborn child (NDHS, 2008). The NDHS shows that 64 percent women pregnant who are expecting their first child are likely to receive ANC services from a skilled birth attendant as compared to 47 percent of women whose births order was at least six (NDHS, 2008). The reason to this could be because the younger class of women is better educated and or have better access to healthcare information through cinemas, films, and other television programs (Olayinka, Achi, Amos, & Chiedu, 2014).

The income status of the family, which often goes with the educational background and employment status, have strong effects on women's attitude, their subjective norm, their perceived behavioral control, and their intention to perform the behavior regarding utilization of TT as a means of protecting the newborn from NNT (NDHS, 2008; UNICEF, WHO, UNFPA, 2000). The income level further allows the women to have access to better quality services as there is means of transport to her disposal, house help to cook for the family, as well as access to information on health care services. There are several studies that underscored that there was a strong relationship between income status of the family and the behavioral intention of a woman in getting vaccinated with the tetanus toxoid vaccine to prevent the newborn from NNT (Abbas & Walker, 1986; Awusi, Anyanwu, & Okeleke, 2009; Onah, Ikeako, & Iloabachie, 2006).

- The Past Experience of Women to Tetanus Toxoid in Preventing NNT

The TPB has shown that the behavioral outcome of a person affects his attitude. Thus, a positive outcome reinforces positive attitudes towards the behavior. If a woman

who had tetanus toxoid vaccination in the past to prevent her newborn from NNT had a positive outcome, the experience would reinforce a positive attitude towards having the tetanus toxoid vaccination in her subsequent pregnancies. Thus, the experience, which a woman had with regards to having tetanus toxoid vaccination, whether positive or negative, affects her present attitude towards the behavior. In a study by Kalaca et al. (2003), the outcome shows that women had the intention to get vaccinated once again with the tetanus toxoid because of the positive experience in their previous pregnancies.

- Knowledge About Neonatal Tetanus

The formation of the salient beliefs of people in some certain behaviors is largely dependent on knowledge as it forms the basis of cognition. It is essential that a woman possess the right knowledge on NNT as a disease and the protection that tetanus toxoid confer to mothers and their unborn children. Thus, when a woman knows the case definition of NNT, how the disease comes about, and the benefits of the tetanus toxoid vaccine in the protection of the disease, her attitude to TT vaccination, subjective norm on the disease protection using vaccines, perceived behavioral control on the disease and ways of protecting it, and behavioral intention with regards to getting TT vaccine changes. The knowledge has a positive impact on her, which in turn makes her comply with the vaccination regimen (You et al. 2005). Emeribe & Akah (2011) in their paper to observe the causes of NNT in the African child also stressed NNT as the commonest cause of death. The authors also noted factors leading to NNT to include: poor hygiene, use of non-sterile materials in treating the stump of umbilical cords in newborns, lack of ANCs, high-level illiteracy, and non-utilization of tetanus toxoid immunization. The

authors recommend creating awareness on NNT as well as benefits of ANCs and legislating that women of childbearing age must have a full course of TT.

Often, the culturally inclined women have little knowledge of NNT and the benefits of tetanus toxoid vaccines in its prevention. The belief in most of the rural women who lack adequate information about NNT is that the disease is caused by witchcraft or a curse inflicted on their newborn by somebody within the community (Bastien, 1995). In a situation like this, mothers often go to see a traditional healer treat their child as they lack the knowledge that it can only be prevented through vaccination of the mother or be treated in a tertiary health institution; this fact was supported by several studies (Mapatano et al., 2008; Adamu & Salihu, 2000; Idris et al., 2006; Awusi et al., 2009).

Access to Antenatal Care Services

Globally, reductions in maternal and neonatal death rates are always associated with accessibility and utilization of maternal health care services (Babalola & Fatusi, 2009; Mekonnen & Mekonnen, 2002). Majority of rural women in the developing countries of sub-Saharan Africa lack access to quality ANC services to prevent their newborn child from NNT (Mekonnen & Mekonnen, 2002; Galadanci et al., 2007; Babalola & Fatusi, 2009). Statistics has shown that in Nigeria, only 58% of the pregnant women attended at least one antenatal clinic throughout their antenatal period. While there are 35% of deliveries that occur in health facilities, and 39% attended to by a skilled birth attendant during delivery, only 43.7% of the women received postnatal care (NDHS, 2008). Dikici et al. (2008) in their assessment of what has changed in the last

decade on neonatal tetanus in Turkey noted that the number of NNT in recent years was lower than in the last decade. The authors suggest that there is still need to step up appropriate health education among the masses, increase access to ANCs, and increase tetanus toxoid immunization among mothers to enable them achieve the NNT elimination goal.

Socioeconomic Factors

Ajaegbu (2013) observed that in Nigeria, socioeconomic status of mothers in the society has a great impact on their use of maternal health services. Additional factors to this include getting approval of the husband to access health services, ability to obtain money from their husbands to pay for these services, unacceptable distance to health care centres, lack of finances to foot in the transport bill, insecurity visiting the facility alone especially in the rural areas, lack of health workers at the health facilities especially female health workers, repeated stock-out of tetanus toxoid vaccine and other childhood vaccines at health facilities, and lack of drugs at the health facilities.

There is a remarkable difference in the socio-economic status of the different regions in Nigeria. In comparison, the southern region has a higher percentage of women who attended western education more than those in the northern region. In the northeast and northwest regions, there are about 70% of women and 35% of men without western education; this when compared the southern region shows 15% of women and 8% of men (NDHS, 2008). The large educational gap that exists between the northern and southern regions in Nigeria could explain the poor information that women have on NNT as well as the benefits of tetanus toxoid vaccines in its prevention. This places pregnant women

especially in the northeast region on the disadvantage side not attending antenatal clinic and get the tetanus toxoid vaccine to protect their unborn children from NNT (NDHS, 2008).

Although cultural and religious practices that place women under the care of their husbands are seen in both the southern and northern regions, this issue is more pronounced in the northern region. This also contributes to the poor utilization of health care services in the northern region. There are literatures, which shows that gainfully employed women utilize health care services better than those who are not employed. This underscores the point that gainful employment gives women the financial power and means to access ANC; this is irrespective of whether their husbands provide resources for them to access these services. Statistics shows that in Nigeria, the percentage of women in the southern region that are gainfully employed in professional or managerial positions is higher than that in the north. Thus, education, employment and income status, important factors among the social determinants of health, have a significant impact on women towards utilizing health care services (NDHS, 2008; Adamu & Salihu, 2000; Idris et al., 2006; Awusi et al., 2009).

Summary and Conclusions

In Nigeria, there is no large-scale study conducted to establish national or regional prevalence of NNT. Furthermore, there is no study that is able to explain why Nigeria is unable to meet with the global NNT elimination deadlines of 1995, 2005, and recently reviewed to 2015. The few studies conducted on NNT are either on incidence of the disease in a tertiary health centre, assess the outcome of managed NNT cases over a time

period in a health centre, or trends of NNT in a health centre; this significant gap in the literature clearly require a research to address. Fetuga et al. (2009) in a study to compare the prevalence rates and outcome of NNT in a Nigerian tertiary hospital over two periods characterized by different national immunization programs - the EPI and the NPI, it was observed that the prevalence and mortality of NNT in Nigeria remains high.

The reasons that contribute to the delay in reaching the NNT elimination goal in the countries that could not meet with the deadline has been declining interest for the program in their respective health ministries and the international community as well. Other reasons include lack of progress of routine immunization services at all levels more especially the rural areas; inadequate financing for population-based supplementary immunization strategies; low coverage with routine timed ANC visits; hard-to-reach rural populations; socio-cultural beliefs and practices; negative rumors that tetanus toxoid is a form of contraceptive to women of childbearing age; poor NNT surveillance system; and low percentage of newborns with clean delivery especially in the rural areas.

Chapter 3 presents the description of the study's design, sample, instrumentation, data analysis, and ethical considerations.

Chapter 3: Research Method

Introduction

This chapter includes a description of this study's design, sample, instrumentation, data analysis, and ethical considerations. An overview of the study design includes a rationale for why this particular research design was selected. The sample characteristics and size, description of the instrumentation, and the data collection process and analysis are also discussed.

The purpose of this study was to quantitatively examine, determine, and assess the prevalence of NNT in the northeast region of Nigeria and to know the reasons for Nigeria's failure to achieve the global NNT elimination deadline. The study uses archival data collected by trained WHO field officers in Nigeria from mothers of NNT children in six provinces of the northeast region between January 1, 2008 and December 31, 2013; the NNT data were collected on behalf of the NPHCDA. In Nigeria, the NPHCDA has the responsibility of policy formulation and overseeing affairs of the nation's primary healthcare. The NPHCDA is a parastatal of Nigeria's Federal Ministry of Health, with a mandate to develop national primary health care policy and support the states and LGAs to implement the policies. The NPHCDA was established in 1992 based on the recommendation of the WHO and merged with the national programme on immunization (NPI) in 2007 (NPHCDA, n.d.). The research questions and hypotheses for this study were as follows:

RQ1 – Quantitative: Did mothers who gave birth to NNT babies receive ANC?

H_{O1}: Mothers who gave birth to NNT babies did not receive ANC while pregnant.

Ha_1: Mothers who gave birth to NNT babies did receive ANC while pregnant

RQ2 – Quantitative: Did mothers who deliver at home get the attention of trained TBAs?

Ho_2: Mothers who deliver at home did not get the attention of trained TBAs.

Ha_2: Mothers who deliver at home did get the attention of trained TBAs.

RQ3 – Quantitative: Did mothers treat the umbilical cord of their newborn babies after birth in a hygienic way?

Ho_3: Mothers who gave birth to NNT babies did not treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Ha_3: Mothers who gave birth to NNT babies did treat the umbilical cord of their newborn babies in a hygienic manner after birth.

The independent variables (IV) for this study were mothers receiving ANC, delivery attended by trained TBA, and hygienic caring of the umbilical cord while the dependent variable (DV) was status of the newborn (NNT).

I present in Table 5 a structured view of the three hypotheses, the independent variables, the dependent variable, and the statistical techniques used to test the hypotheses. Inferential statistics were used to draw conclusions from the sample tested. The Statistical Package for the Social Sciences (SPSS) 22 was used to code and tabulate scores collected from the survey and provide summarized values where applicable including the mean, central tendency, variance, and standard deviation. Descriptive statistics, one-sample proportions test, and chi-squared tests of independence were used to evaluate the three research questions and exploratory analysis.

Table 5

Null Hypotheses with related statistical components

Hypothesis	Independent variable	Dependent variable	Analysis
H1	Received Antenatal Care	Status (no, yes)	Proportions Test
H2	Attended by TBA	Status (no, yes)	Proportions Test
H3	Cord Treated Hygienically	Status (no, yes)	Proportions Test

The *One-Sample Proportion Test* is used to assess whether a population proportion is significantly different from a hypothesized value. This is called the hypothesis of *inequality* (Tabachnick & Fidell, 2007). The hypotheses may be stated in terms of the proportions, their difference, their ratio, or their odds ratio. This procedure calculates sample size and statistical power for testing a single proportion using either exact or approximate tests. Results are based on exact calculations using the binomial distributions.

Research Design and Rationale

This quantitative research study uses NNT data collected through cross-sectional survey design to answer the research questions, and to also measure the relationship between independent and dependent variables. The data for use in this study was collected by the WHO between January 2008 and December 2013. The quantitative research method, which differs from the qualitative approach, seeks to accept or reject a particular hypothesis through the use of research. The quantitative approach serves as the most appropriate means of answering research questions on the relationships or differences between variables in the study (Creswell, 2009). The advantage of using this quantitative approach lies in its use of descriptive research processes that provide

sufficient information about the relationship between the variables being investigated; this enables prediction and control over future outcomes. The quantitative method produces numbers as data and shows that it is an ordered system as it also controls extraneous variables within the internal structure of research studies for the data to be more reliable.

The rationale for the selection of cross-sectional survey design in this quantitative research was because of its wider applicability and that it provides numerical descriptions of trends, opinions, as well as measure level of occurrence of an event (Creswell, 2009). The design gives a good measure on how many members of the population have particular knowledge, assesses their attitudes, and or their engagement in a particular behavior (Siegel & Lotenberg, 2007; Creswell, 2009). The quantitative method gives a better understanding of the research problems and also helps researchers to know much about the problem under study e.g., how common or how widespread is a problem. In addition to these, the results of quantitative studies are generalizable to a larger sample of the same population (Creswell, 2009).

The other advantages of the selected study design were that it helps researchers to generate a research question rather than establish causality, and in changing what is going on around the population of interest. Most importantly, the outcome gives a better result through selection of the ideal form of systematic inquiry, that allows researchers to make a difference in the world that helps people, change systems, and improves programs. Additionally, the selected design for this study allows researchers in validating a theoretical hypothesis for a new set of people or in a new setting.

The selected design was ideal for this research as it helps to gather information on knowledge, attitude, practice and awareness from the participants that can be used in formative research or as part of the process or outcome evaluation (Siegel & Lotenberg, 2007). Furthermore, the result from this research design is truly representative of the surveyed population because selection of interviewees is in a standard way. Also, this design uses a sample that represents the population so that the researcher would be able to make generalizable claims or conclusions on the general population (Creswell, 2009).

The quantitative cross-sectional design is considered as a perfect and unbiased way for this study to: describe actions of the participants; assess trends of NNT and measure level of occurrence of NNT in the northeast region of Nigeria; assess the practice of ANC among women of childbearing age; assess tetanus toxoid vaccination status among these women; evaluate behaviors of mothers towards hospital deliveries, deliveries through TBAs, and also assess how mothers manages umbilical cord of their newborn babies. Nonetheless, this study would be analytic in nature so as to investigate associations between exposure to risk factors and the outcome of interest.

Operational Model

The operational model for this study consists of three independent variables and one dependent variable, as clearly outlined in this study. The first independent variable was mothers receiving ANC, while the second and third were hygienic caring of the umbilical cord, and delivery attended by trained TBAs accordingly. As shown in Figure 2, the dependent variable (DV) was status of the newborn (NNT).

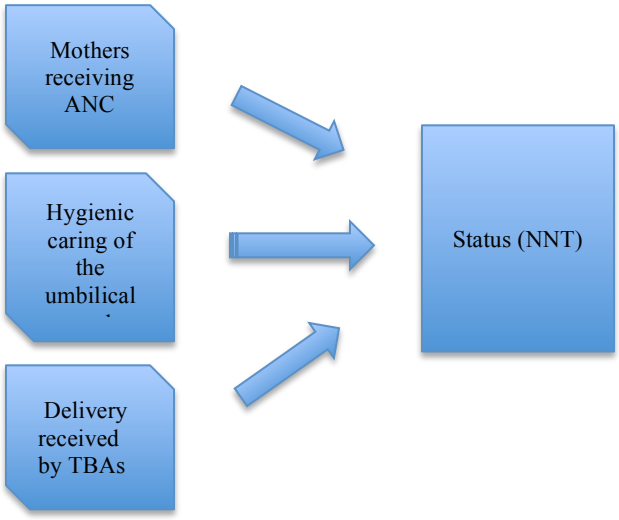

Figure 2. Model of hypothesized relationship between independent and dependent variables.

Methodology

Population

The participants were women who gave birth to NNT children from the northeast region of Nigeria. The northeast region comprises six provinces (Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe), with Islam and Christianity as the two dominant religions; the two major tribes in the region are Hausa and Fulani. The main occupation of especially the rural dwellers in this less densely populated region of the country is farming, often with large-scale production of crops and livestock. The northeast region has poorer and worse health outcomes in comparison with other regions in the southern part of the country (CIA, 2014; NDHS, 2008).

Although the northern and southern regions of Nigeria have a distinctly different socioeconomic background, there are some similarities on the cultural and religious practices of these two regions. Thus, the negative effect of the difference in

socioeconomic background between these two regions could explain the poor utilization of ANC services, preference for home deliveries, lack of trained TBAs to receive deliveries, as well as the high prevalence of the vaccine preventable diseases especially NNT that is seen in the northern region and more especially the northeast sub-region. This statement could be supported by the fact that in the north, 90.1% of women are more likely to deliver at home as compared to 22.5% in the south. Furthermore, births that are attended to by skilled professionals in the southern region are about 81.8% in comparison with as low as 9.8% in the north (NDHS, 2008).

It was observed that the increase in the number of NNT cases, in spite the claim of wide coverage of TT of the female population by EPI officers, is not unrelated to lack of immunization of mothers with TT during pregnancy, home delivery, delivery by unskilled birth attendants, application of ghee/surma on umbilical cord, and cutting of umbilical cord by unsterilized tools (scissors, kitchen knife, blade). Thus, the need for proper immunization with TT during ANCs, and practice of hygienic deliveries to control the disease would reduce mortality in neonates and achieves the NNT elimination target (Zafar, Rasheed, & Abdulghaffar, 2012).

As earlier shown in Table 1, the statistics of the northeastern region are: total fertility rate of 7.2 (national 5.7), motherhood age of 15-19 is 39% (national 23%), women who gave birth and received ANC from a skilled provider 43% (national 58%), births assisted by a skilled provider 16% (national 39%), births delivered in a health facility 13% (national 35%), children 12–23 months fully immunized 8% (national 23%), children 12–23 months with no immunizations 33 (national 29%), literate women age

15–49/men age 15–49, stands at 23/54% (national 54/77%), and those with no education women age 15–49/men age 15–49 stands at 68/45% (national 36/19%) (NDHS, 2008).

Sample

The sample for this study was NNT cases from the six provinces in northeast Nigeria obtained through NNT case-based surveillance of mothers who gave birth to NNT babies, and archived in the WHO database between January 1, 2008 and December 31, 2013. This study calculates the prevalence of NNT in the northeast region using estimated live births for Nigeria. The estimated live birth obtained is based on the World Bank projected growth rate of 3.2 and CBR of 44.25, and the estimated Nigeria's population of 180,049,322 (NPC, 2014).

Importantly, the geographic characteristic of the study participants was assumed to represent the general population in the northeast region of Nigeria. The data for this study were collected from women of childbearing age whose newborn babies were diagnosed with NNT using a standardized instrument specifically designed and developed by the WHO (see Appendix A).

Sampling and Sampling Procedure

The sampling design for this study is single stage probability random sampling; the selection of this is to ensure that every woman of childbearing age within the population has an equal chance of being selected so that the outcome would be valid, reliable, and generalizable (Frankfort-Nachmias & Nachmias, 2008; Creswell, 2009). However, the sampling technique used in the selection of participants is stratified random

sampling. Using this sampling technique, samples are initially grouped into strata then a sample selected from each stratum.

Prior administering the questionnaire, informed consent was obtained from the local authorities and husbands of these women. The participants were well informed on the purpose of administering the questionnaire in the local language that they understood. However, the information collected from the mothers of NNT children was securely kept in the official database, and restricting data access except to authorize persons.

As shown in Appendix A, the instrument for use in gathering information from the respondents is structured and contains closed-ended questions administered in the form of face-to-face interviews (Creswell, 2009). The instrument 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 interviewers ask participants (mothers of NNT children) questions that include: their vaccination history while pregnant (whether vaccinated with TT, the doses received, do they have immunization hand cards); the birth of the baby (delivered at hospital or health center, delivered at home and attended by trained birth attendant, delivered at home attended by untrained birth attendant, delivered at home unattended, umbilical cord cut with a sterile blade, umbilical cord cut with something else, what was used to treat the umbilical cord, whether the mother received ANC while pregnant, the total number of prenatal visits by the mother, and was she attended by a doctor/nurse or

trained TBA/midwife); clinical history of the baby; treatment received by the baby; the response taken afterwards (did mother received prophylactic TT dose within 3 months of the period of the report or was supplemental immunization conducted within the same locality); and then final classification of the case (was it NNT, not NNT or unknown).

Power Analysis

The sample size for this study was 312 NNT cases in the northeast region from 2008 to 2013. The *One-Sample Proportion Test* calculates the sample size and statistical power for testing a single proportion using either exact or approximate tests; this is aimed at avoiding all potential threats to validity and biases, and to ensure that outcome of the study is generalizable to a larger population (Tabachnick & Fidell, 2007).

Operational Variables

The operational variables for this study, as clearly outlined, were three independent variables (IV) and one dependent variable (DV). The IVs were "mothers receiving ANC", "hygienic caring of the umbilical cord", and "delivery attended by trained TBAs." The DV was "status of the newborn" (NNT); these variables were discussed below.

Attending Antenatal Care (ANC)

Attending ANC means ability of a pregnant mother to access care from a health specialist throughout her period of pregnancy. The care is such that a record is opened for her medical history, her health needs assessed, gets medical advice and guidance related to the pregnancy and delivery of her unborn child, essential screening tests and treatment for infections conducted, gets health education on self-care throughout pregnancy, to

identify conditions that are considered detrimental during the pregnancy, and also obtain first-line management and referral when required. However, the WHO recommends a minimum of four ANC visits throughout the period of pregnancy. Thus to assess whether the mother received ANC while pregnant is expressed and measured using a nominal scale of 1 = Yes, 2 = No, or 9 = Unknown.

Traditional Birth Attendant (TBA)

The TBA means any person, who must have acquired skills to deliver babies herself or through apprenticeship, that assists pregnant mothers during childbirth and (WHO, 1992). However, the TBAs whether trained or untrained are not regarded as skilled birth. The question whether during delivery the mother was attended to by a trained TBA/Midwife is also expressed and measured in same manner using a nominal scale of 1 = Yes, 2 = No, or 9 = Unknown.

Umbilical Cord Care

The umbilical cord which transports nutrients from the mother to baby in-utero cease to function after birth; the stump usually dries up and falls off within 1-2 weeks after the newborn is born. The umbilical cord care aims to ensure that infection by especially tetanus bacteria and irritation of any sort are avoided; this could be done by keeping the cord clean by adhering to either or all of the following: rubbing the base of the cord with a methylated spirit, or using Goldenseal root and Echinacea; keeping the area dry through adequate ventilation; using sponge bath until after the cord falls off, and allowing the cord to heal naturally (American Pregnancy Association, 2011).

The aspect on whether the newborn's umbilical cord was treated in a hygienic way using spirit or unhygienic way using other means is also expressed and measured using a nominal scale of 1 = Yes, 2 = No, or 9 = Unknown.

Neonatal Tetanus (NNT)

The term NNT could be confirmed or suspected as the case may be. Confirmed NNT case refers to any newborn that cries within the first 48 hours of life and normally suck, and then fail to suck between 3 and 28 days of life, or becomes stiff or has started having convulsions or both (WHO, 2008, 2014). A suspected NNT case refers to death of the newborn that occurred within 3-28 days after birth from an unknown cause, or a reported neonate that suffered from neonatal tetanus within 3-28 days of life without being investigated (WHO, 2008, 2014). Thus, the final classification of a case as NNT is expressed and measured using a nominal scale of 1 = Yes, 2 = No, or 9 = Unknown.

Data Collection

The secondary NNT data used in this study was collected from mothers of NNT children by field officers of the WHO working towards achieving the NNT elimination deadline from across the six states in the northeast region of Nigeria. These field officers collected these data from between January 1, 2008 through December 31, 2013. This information is restricted and accessible only to authorized persons on getting approval from the NPHCDA or WHO. Approval was obtained from the NPHCDA to access and use the NNT data and the instrument used in the data collection for the purpose of this dissertation.

The NNT data was secured in an electronic file and restricted with a password to avoid unauthorized access. However, information such as name of the patients, names of the parents, and address were not linked to respondent's file. The data was utilized in accordance with the acceptable standard research procedural guidelines; the data is published only in aggregate form. The data will be retained with a passcode to prevent unauthorized access for three to seven years after which it will then be destroyed when it is no longer needed.

It is assumed that collection of the secondary data used in this dissertation was carried out in a structured and fairly rigid manner (Creswell, 2009). The NNT data is presented in a descriptive way after undergoing analysis such as means, frequency, tables and charts (Creswell, 2009). The research questions outlined earlier are to be answered through test of hypotheses, and to determine if any significant differences in frequency existed between dependent and independent variables accordingly. The IVs for this study were mothers receiving ANC, hygienic caring of the umbilical cord, and delivery attended by trained TBA while the DV was status of the newborn (NNT).

The unit of analysis in this dissertation was individual because the data that was obtained by interviewing mothers of NNT babies. The variables on the case-based investigation questionnaire were developed based on the following: vaccination history of mothers (whether vaccinated with TT, the doses, availability of hand cards); birth of the baby (delivery at hospital or health center, home delivery attended by trained TBA, home delivery attended by untrained birth attendant, or home delivery with no attendant, umbilical cord cut with a sterile blade or something else, description of treatment of

umbilical cord, whether mother received ANC, number of prenatal visits and if attended to by a doctor/nurse or trained TBA/midwife); clinical history of the baby; treatment received by the baby; response taken (did mother received prophylactic TT vaccine during 3 months period of the report or was supplemental immunization conducted within the same locality); then final classification of the case (neonatal tetanus or not or unknown).

Instrumentation and Operationalization of Constructs

The instrument for use in data collection is a structured questionnaire that contains closed-ended questionnaire. The interviewers are trained WHO field officers; they administered the questionnaires in the form of face-to-face interviews (Creswell, 2009). The instrument, which was designed and developed in 2003 for use in NNT surveillance, has been used across the globe and thus considered a gold standard. The first column captures demographic information of the mothers; the basic information contained in the form include the patients' age, gender, state, local government area (LGA), nearest health facility to village, neighborhood, town/city, address, patients' name as well as the names of the parents. The questions in the other columns aim to capture additional information with regards to 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 types of measurements used in quantitative research studies are nominal, ordinal and interval. In this research study, the measurements used were ordinal and interval. The ordinal measurement to use in collecting the NNT data was carried out in

such a way that the final outcome would be able to establish the cause of the NNT; this was answered in this form: 1 = Yes; 2 = no; and 9 = unknown. The set of other questions on the instrument assess the vaccination history of the participants while pregnant; the birth of a baby whether at hospital or health center, home delivery attended by TBA, home delivery attended by inexperienced/untrained birth attendant, home delivery unattended; whether the umbilical cord was cut with a sterile blade or something else; how the umbilical cord was treated; if the mother received ANC during pregnancy; the total number of prenatal visits by mothers, and was she attended by a doctor/nurse or trained TBA/midwife); clinical history of the baby; treatment received by the baby; the response taken afterwards (did mother received prophylactic TT vaccine during 3 months period of the report or was supplemental immunization conducted within the same locality); and then final classification of the case (was it NNT, not NNT or unknown).

The interval measurement was presented during the time of plotting graphs and charts (Frankfort-Nachmias & Nachmias, 2008). Additionally, data transformation of missing data was done through the use of available mathematical and statistical programs (Frankfort-Nachmias & Nachmias, 2008; Szklo & Nieto, 2014).

The data used was in accordance with the acceptable research guidelines as only data in aggregate form was published. Furthermore, the data would be retained in a secure folder for a period of at least three years after; in the absence of need for further use, the data will be destroyed within seven years from the time it was collected. This will be done in the form of data cleaning or erasing using an online eraser.

Threats to Validity

In this research study, validity was assessed in a manner that identified whether a measure of mothers not receiving ANC measured that and not something else. The two types of validity used in social science research are internal and external validity (Creswell, 2009); the internal validity assesses cause-effect relationship between the dependent and independent variables.

The quality of the items on the data collection instrument was sought with content validity; it was a standard tool used across the globe by the WHO to collect NNT data. The content clearly measures what it was expected to measure; thus validity and reliability of the measurement instrument was well tested (Frankfort-Nachmias & Nachmias, 2008; Szklo & Nieto, 2014).

In social science research, the reliability and score validity of instruments tend to reduce when the items could stir-up emotions in an unfavorable approach, which could adversely affect the measure of the attitude of interest in the research (Szklo & Nieto, 2014; Frankfort-Nachmias & Nachmias, 2008). Additionally, when the items on the instrument are difficult for the respondents to remember or answer easily, issues with validity and reliability also sets in. The questions in this instrument were designed in such a way that mothers could easily remember and answer. Also, there is convergent validity that assesses which measure relates to the construct that was measured in research, and also discriminant validity, which assesses what was not measured from other constructs (Frankfort-Nachmias & Nachmias, 2008).

Analysis

Data analyses were based on the weighted samples and done using SPSS version 22. The SPSS statistical application was to help account for the complex sampling design of the survey and weighted observations. The study analyzes NNT data obtained from the six northeast provinces to compute the prevalence of NNT in the region, and to conduct single sample proportions test to determine if any significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within the six provinces in the region. Exploratory analysis was performed to ascertain if differences in frequency between the variables existed. A chi-squared test of independence was conducted to determine if significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within the six provinces.

The results of the analyses were presented in Chapter 4 under different sections as follows: research questions, baseline descriptive and demographic characteristics of the sample, the prevalence, the analysis of the differences in frequency between the variables, and summary of results. In the summary portion of the results was a brief discussion on an overview of the research, the selected study design, and the statistical results obtained.

Ethical Procedures

The ethical considerations for this study involved safety and protection of human rights through non-disclosure of the participant's identities and avoidance of conflict interest such as royalty or bias. Approval was obtained from the NPHCDA for the use of the NNT data for the purpose of this study. Additionally, an approval for this study was

obtained from the IRB. This study ensures that identities of the participants was not made known to any third party unless for the purpose of this study. While result of the study was treated with confidentiality, feedback would be shared with the NPHCDA, WHO, and other partner agencies. There was no conflict of interest in this study.

Summary

In summary, this quantitative cross-sectional survey study was designed to examine, determine, and assess the prevalence of NNT in the northeast region of Nigeria and to know the reasons for Nigeria's failure to achieve the global NNT elimination deadline. The study uses archival data collected by trained WHO field officers in Nigeria from mothers of NNT children in six provinces of the northeast region between January 1, 2008 and 31st December 31, 2013.

This chapter gave a detailed description of the research methodology used in this research. The chapter described the population, sample/sampling methodology for the study, power analysis, the operational variables, data collection procedure, instrumentation, statistical tools for the data analysis/data interpretation, ethical considerations, assumptions, and limitations/delimitations. The results of the study are presented in Chapter 4, along with a description of the data collected and the data analysis procedures.

Chapter 4: Results

Introduction

The main purpose of this secondary data analysis was to establish the prevalence of NNT in the northeast region and to conduct single sample proportions test to determine if any significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within the six Nigerian provinces. I performed exploratory analysis to ascertain if differences in frequency between the variables existed. Additionally, chi-squared test of independence was conducted to determine if significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within six Nigerian provinces.

The methodology for collecting the data used in the analysis was discussed in Chapter 3. This chapter briefly presents the research questions, baseline descriptive and demographic characteristics of the sample, the prevalence and the analysis of the differences in frequency between the variables. The chapter concludes with a summary of the research findings.

Data Analysis

Inferential statistics was used to draw conclusions from the sample tested. The Statistical Package for the Social Sciences (SPSS) 22 was used to code and tabulate scores collected from the survey and provide summarized values where applicable including the mean, central tendency, variance, and standard deviation. Descriptive statistics, one-sample proportions test, and chi-squared tests of independence were used to evaluate the three research questions. The research questions are:

RQ1 – Quantitative: Did mothers who gave birth to NNT babies receive ANC?

RQ2 – Quantitative: Did mothers who deliver at home get the attention of trained TBAs?

RQ3 – Quantitative: Did mothers treat the umbilical cord of their newborn babies after birth in a hygienic way?

Table 6

Summary of Variables and Statistical Tests used to Evaluate Research Questions 1-3

Research Question	Independent Variable	Dependent Variable	Analysis
1	Received Antenatal Care	Status (no, yes)	Proportions Test
2	Attended by TBA	Status (no, yes)	Proportions Test
3	Cord Treated	Status (no, yes)	Proportions Test

Prevalence Rate

The estimated Nigeria's population of 180,049,322 (NPC, 2014), and as shown in Table 7, the estimated live births in the northeast region stands at 1,082,754.

Thus, using a sample size of 312 NNT cases between January 1, 2008 and December 31, 2013, the prevalence (P) of NNT per 1,000 live births in the northeast region is:

$$P = \frac{\text{Persons with a given health indicator during a specified time period}}{\text{Population during the same time period}} \times 1000$$

P = (NNT cases from January 2008 and December 2013/1,082,754) x 1,000

P = (312/1,082,754)/1,000 = 0.00028815 x 1,000 = 0.28815

Thus, the prevalence rate of NNT in the northeast region between January 2008 and December 2013 is 0.28815 x 100% = 28.815%

Table 7

Projected NNT Population for 2014

S/N	States	Growth rate	Total population 2014 (projected from 2006 census NPC figures)	Live Birth population (approx. average CBR of 44.25 from world bank figures of 1960-2011)
1	Adamawa	2.9	3,982,190	176,212
2	Bauchi	3.4	6,110,574	270,393
3	Borno	3.4	5,424,219	240,022
4	Gombe	3.2	3,028,459	134,009
5	Taraba	2.9	2,866,486	126,842
6	Yobe	3.5	3,057,092	135,276
Grand Total		19.3	24,469,021	1,082,754

Demographics

Data were collected from a sample of 312 mothers from the northeast region of Nigeria. Specifically, 58% (182/312) of the participants had male children (n =182) and the remaining 42% (130/312) had female children (n = 130). Additionally, 8% (25/312) were from Adamawa province (n = 25), 20% (62/312) were from Bauchi province (n = 62), 28% (86/312) were from Borno (n = 86), 17% (53/312) were from Gombe province (n = 53), 18% (55/312) were from Taraba province (n = 55), and the remaining 10% (31/312) were from Yobe province (n = 31). A cross tabulation of the participants' province and babies' gender were displayed in Table 8.

Table 8

Cross Tabulation of the Sex of Participants' Baby and Province

Province	Sex of Baby		Total
	Male	Female	
Adamawa	6	19	25
Bauchi	43	19	62
Borno	48	38	86
Gombe	34	19	53
Taraba	26	29	55
Yobe	25	6	31
Total	182	130	312

Although highest number of neonates with NNT 26% (80/306) was recorded in 2010 as shown in Table 9, the trend shows a decrease in cases from 2011 with fewer cases 9% (27/306) recorded in 2013. Additionally, Borno province had the highest NNT cases in the region 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).

Table 9

Cross Tabulation of the Babies' Birth Year and Province

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

From the sample of 312 participants, two said 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. Demographic statistics of the two participants with non-NNT babies and those that did not respond to NNT status were displayed in Table 10.

Table 10

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

Analysis of Research Questions 1-3

Research questions 1-3 were evaluated using frequency statistics and chi-squared tests of independence to determine if significant differences in the frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within six Nigerian provinces. The independent variable (IV) for research question 1 was whether the mother received antenatal care (yes, no); the IV for research question 2 was whether the mother had a TBA attendant (yes, no); and the IV for research question 3 was whether the

umbilical cord was treated (yes, no). The dependent variable (DV) for research questions 1-3 was the province.

The chi-square results shown in Table 11 indicates that significant differences in the frequency of receiving ANC and cord treatment between the provinces existed, whereas no such differences was found in the frequency of mothers that were attended by a TBA between the provinces.

Table 11

Summary of Results for Research Questions 1-3

Research Question	Independent Variable	Dependent Variable	Test	Sig. (p)
1	Received Antenatal Care	Province	Chi-squared Test of Independence	< .001
2	Attended by TBA	Province	Chi-squared Test of Independence	.344
3	Cord Treated	Province	Chi-squared Test of Independence	.005

Data Cleaning

Before the research questions were evaluated, the data were screened for missing data. Missing data were investigated using frequency counts, and several cases were found within the distributions. Specifically, 39 participants did not state whether they had received ANC ($n_{missing}$ = 39), 141 did not state whether they had been attended by a trained TBA ($n_{missing}$ = 141), and 96 did not state whether they had their umbilical cord treated ($n_{missing}$ = 96). Thus, responses from 312 data participants were received and 273 were evaluated by the chi-squared model for research question 1 (n = 273); 171 were evaluated by the chi-squared model for research question 2 (n = 171); and 216 evaluated

by the chi-squared model for research question 3 (n = 216). Displayed in Table 12 are cross tabulations of the frequencies of mothers that received ANC, were attended by a TBA and had their cord treated across the six provinces in the region.

Table 12

Cross Tabulation of Whether Participants' Received Antenatal Care were Attended by a TBA and had their Umbilical Cord Treated, by Province

	Province						
	Adamawa	Bauchi	Borno	Gombe	Taraba	Yobe	Total
Received Antenatal Care							
Yes	12	23	12	28	18	6	99
No	9	36	65	22	37	5	174
Total	21	59	77	50	55	11	273
Attended by TBA							
Yes	5	11	7	11	16	1	51
No	12	25	35	17	28	3	120
Total	17	36	42	28	44	4	171
Cord Treated							
Yes	11	13	10	13	19	3	69
No	8	36	49	28	23	3	147
Total	19	49	59	41	42	6	216

Results of Hypotheses

The sample proportions test was conducted to determine if existed significant differences in frequency of ANC existed between mothers that indicated receiving care and those that did not, mothers that received attention from trained TBAs, and mothers that received treatment of umbilical cord of their newborns and those that did not. The IVs are mothers receiving ANC, delivery attended by trained TBA, and hygienic caring of the umbilical cord while the DV is status of the newborn (NNT).

Hypothesis 1

Using SPSS 22, single sample proportions test was conducted to determine if significant differences in frequency of ANC existed between mothers that indicated receiving care and those that did not.

Ho_1: Mothers who gave birth to NNT babies did not receive ANC while pregnant.

Ha_1: Mothers who gave birth to NNT babies did receive ANC while pregnant

Using SPSS 22, single sample proportions test was conducted to determine if significant differences in frequency of ANC existed between mothers that indicated receiving care and those that did not. Results from the test found that a significant difference did exist; *z-statistic* ($N = 273$) = 4.50, $p < 0.001$; 95% confidence interval (CI) = 0.308 to 0.421. The null hypothesis for H1 was rejected. Thus, mothers giving birth to NNT babies reported significantly fewer incidences of receiving ANC. Figure 1 graphically displays the difference between mothers that reported receiving ANC compared to mothers that did not.

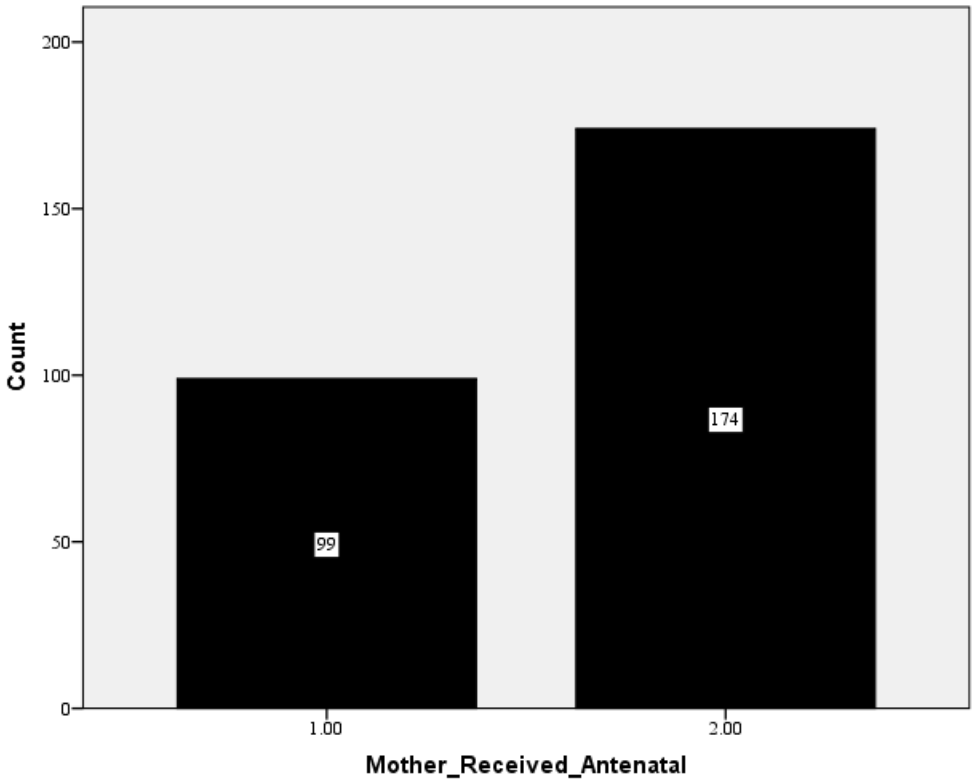

Figure 3. Mothers who gave birth to NNT babies by antenatal care status.

Hypothesis 2

Ho_2: Mothers who deliver at home did not get the attention of trained TBAs.

Ha_2: Mothers who deliver at home did get the attention of trained TBAs.

Using SPSS 22, single sample proportions test was conducted to determine if significant differences in frequency of receiving the attention from trained TBAs existed between mothers that indicated receiving treatment and those that did not. Results from the test found that a significant difference did exist; *z-statistic* (N = 171) = 5.278, $p <$ .001; 95% confidence interval (CI) = .235 to .371. The null hypothesis for H1 was rejected. Thus, mothers giving birth to NNT babies reported significantly fewer incidences of receiving care from trained TBAs. Figure 2 displays the difference between

mothers that reported receiving midwife care at delivery compared to mothers that did not.

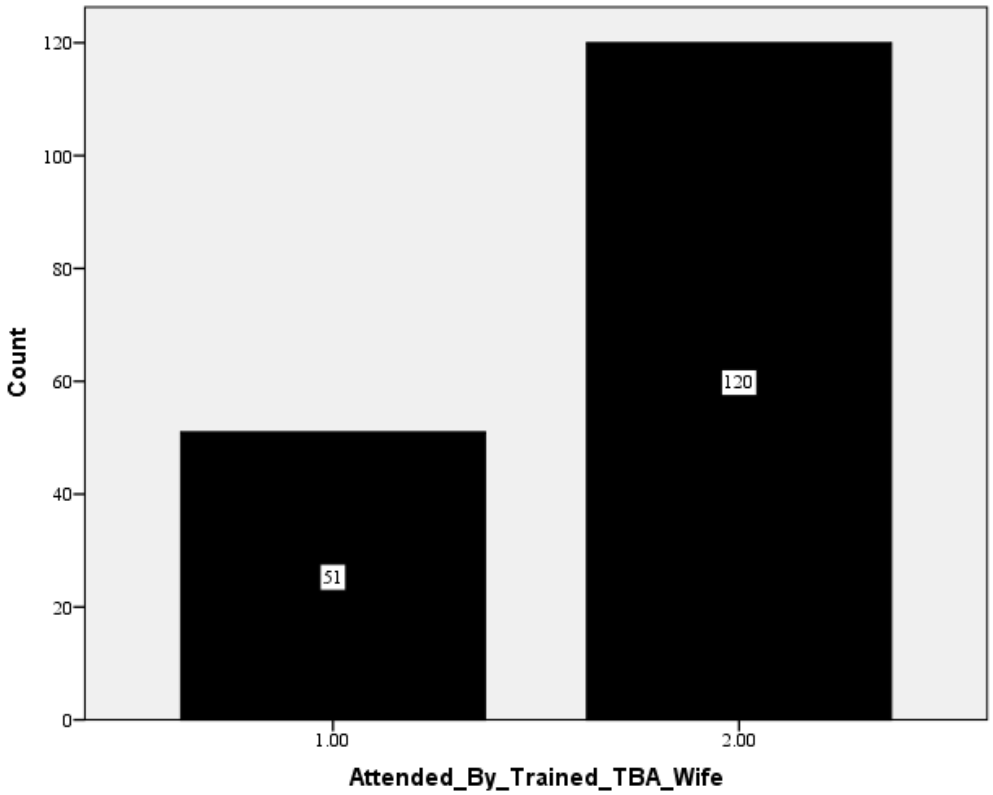

Figure 4. Mothers who gave birth to NNT babies attended by trained TBA care status

Hypothesis 3

Ho_3: Mothers who gave birth to NNT babies did not treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Ha_3: Mothers who gave birth to NNT babies did treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Using SPSS 22, single sample proportions test was conducted to determine if significant differences in frequency of umbilical cord treatments existed between mothers that indicated receiving treatment and those that did not. Results from the test found that

a significant difference did exist; *z-statistic* (N = 216) = 5.309, $p < .001$; 95% confidence interval (CI) = .261 to .384. The null hypothesis for H3 was rejected. Thus, mothers giving birth to NNT babies reported significantly fewer incidences of proper umbilical cord treatments. Figure 3 graphically displays the difference between mothers that reported hygienic treatment of the umbilical cord compared to mothers that did not.

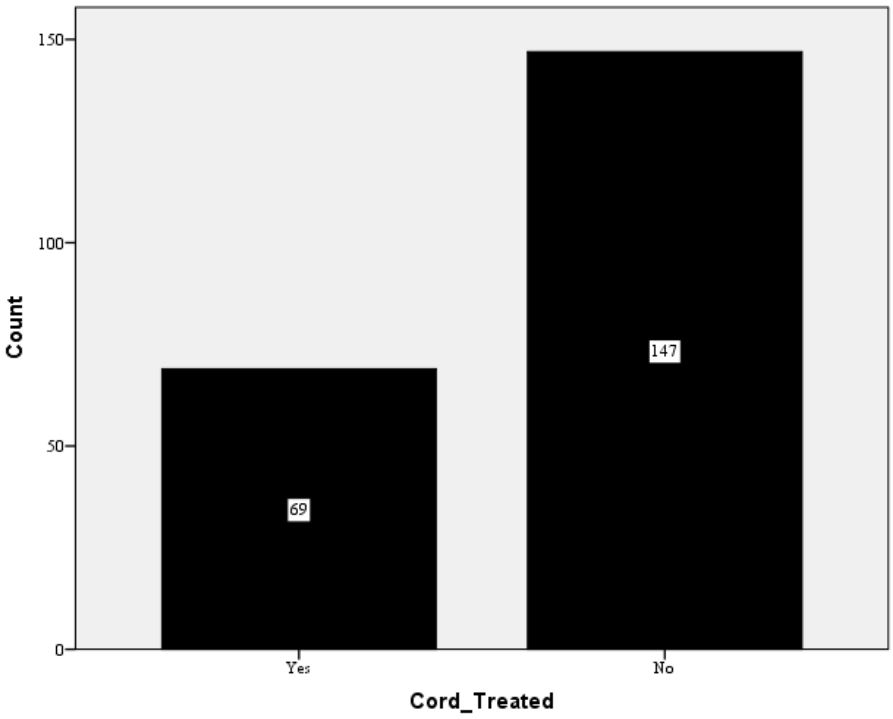

Figure 5. Mothers that gave birth to NNT babies by umbilical cord treatment status

Exploratory Analysis

Using SPSS 22, chi-square test of independence was conducted to determine if significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within six Nigerian provinces. Results indicated that there were significant differences in the frequencies of mothers that received ANC between Nigerian provinces ($p < .001$) and mothers that had their umbilical cord treated ($p = .005$) — see

Table 13 for summary details of the chi-squared tests of independence for Hypotheses 1-3. Overall, there were nearly twice as many mothers that did not receive ANC (n = 174) as compared to those that did receive ANC (n = 99). Additionally, in the Borno province, 84% (65/77) of the mothers did not receive ANC (n = 65); and in the Taraba province, 67% (37/55) did not receive ANC (n = 37). Furthermore, there were twice as many births in Nigeria where the umbilical cord was not treated (n = 147) as compared to births with cord treatment (n = 69). In the Borno province, 83% (49/59) of the births did not receive cord treatment (n = 49); in the Bauchi province, 73% (36/49) did not receive cord treatment (n = 36); and in the Gombe province, 68% (28/41) of the births did not receive cord treatment (n = 28). Lastly, a significant difference in the frequency of mothers that were attended by a trained TBA was not found between provinces (p = .344).

Table 13

Summary of Chi-squared Tests of Independence for Hypotheses 1-3

Hypothesis	Independent Variable	Pearson Chi-Square (χ^2)	df	Sig. (p)	Cramer's V
1	Received Antenatal Care	28.711	5	< .001	.324
2	Attended by TBA	5.626	5	.344	.181
3	Cord Treated	16.963	5	.005	.280

Dependent variable = province

Summary

The objectives of this study were to establish the prevalence of NNT in the northeastern Nigeria, and to assess the relationships that may exist between the dependent and independent variables, using 312 study participants that met all the inclusion criteria. The NNT dataset used for this study was from the northeastern region of Nigeria that was

collected between January 1, 2008 and December 31, 2013. The data is obtained from Nigeria NPHCDA for the purpose of this dissertation.

I presented the findings of this study in this Chapter, including demographics, reliability and data analysis, and study results. The data used for analysis were screened using appropriate statistical test to evaluate the normal distribution and variance. The data was subjected to appropriate statistical methods to determine the relationship between the independent variables (mothers receiving antenatal care, delivery attended by traditional birth attendant, and hygienic caring of the umbilical cord) and the dependent variable (status of the newborn - NNT).

The findings of the analysis indicated that significant differences did exist in all the three tested hypotheses. Thus, mothers who gave birth to NNT babies reported significantly fewer incidences of receiving ANC, mothers who gave birth to NNT babies reported significantly fewer incidences of receiving care from trained attendants, and mothers who give birth to NNT babies reported significantly fewer incidences of proper umbilical cord treatments. Null Hypotheses for the three research questions were all rejected in favor of the Alternative Hypotheses.

Still, the results of the chi-square test of independence conducted to determine if any significant differences in the frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within the six Nigerian provinces showed that there were significant differences in the frequencies of mothers that received ANC between Nigerian provinces and mothers that had their umbilical cord treated. However, a significant difference in the frequency of mothers that were attended by trained TBAs

was not found between the provinces; this is notwithstanding the fact that frequency ratios were similar to those that did/did not receive ANC and cord treatment. On the overall, it could be deduced that there were nearly twice as many mothers that did not receive ANC as compared to those that did receive ANC.

The final section, Chapter 5, presents the interpretation of the findings, limitations of the study, recommendations as a result of the stated findings, a discussion on the implications and potential impact for positive social change, recommendation for practice, and conclusions.

Chapter 5: Discussion, Conclusion, and Recommendations

Introduction

NNT remains a major contributor to the neonatal death rates in Nigeria; this problem calls for a concerted effort by the government and other stakeholders to achieve the revised global NNT elimination deadline of 2015. Although several efforts have been made towards improving the health of children across the globe with notable results obtained especially in the developed countries, the developing countries are still having immense challenges with high infant and neonatal death rates. As estimated by the WHO, out of the 10 million global annual deaths of children under the age of 5 years, four million of these deaths occur within the first 28 days of life. However, 2/3 of these neonatal deaths, which are preventable, are as a result of vaccine preventable diseases, prematurity and birth asphyxia. It is overwhelming to note that 99% of these deaths are seen in the low and mid-income countries of the world (WHO, 2004; Kippenberg et al., 2005; The MDG Report, 2012).

In previous research conducted, the prevalence of NNT in the developing countries is more in the underserved communities 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 ANC services, health inequity, poverty, illiteracy, cultural barriers, beliefs and lots more, thus exposing umbilical cord of the newborn to the bacteria (Ogunlesi, 2011; Akani et al., 2004; WHO, 2004; Roper et al., 2007).

Though the ongoing global NNT elimination has recorded appreciable progress, Nigeria still remains among the 15 African countries that account for 90% of the global NNT cases because they are unable to reach the MNT elimination status (UNICEF, WHO, UNFPA, 2000; WHO, 2014; UNICEF, 2014). The following research questions were outlined for this study:

RQ1 – Quantitative: Did mothers who gave birth to NNT babies receive ANC?

Ho$_1$: Mothers who gave birth to NNT babies did not receive ANC while pregnant.

Ha$_1$: Mothers who gave birth to NNT babies did receive ANC while pregnant

RQ2 – Quantitative: Did mothers who deliver at home get the attention of trained TBAs?

Ho$_2$: Mothers who deliver at home did not get the attention of trained TBAs.

Ha$_2$: Mothers who deliver at home did get the attention of trained TBAs.

RQ3 – Quantitative: Did mothers treat the umbilical cord of their newborn babies after birth in a hygienic way?

Ho$_3$: Mothers who gave birth to NNT babies did not treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Ha$_3$: Mothers who gave birth to NNT babies did treat the umbilical cord of their newborn babies in a hygienic manner after birth.

Through the use of quantitative analysis to answer the research questions, the source of the dataset was data collected for the NPHCDA by the WHO Nigeria using a standard Case-Based Investigation tool became the source of the dataset. There were 312

participants for this study who answered the questionnaire between January 2008 and December 2013.

Interpretation of the Findings

I used SPSS 22 to analyze the data for the three research questions. The criterion variable for the three research questions was the status of the newborn (NNT). The predictor variables for Research Questions 1 to 3 were mothers receiving ANC; hygienic caring of the umbilical cord; and delivery attended by TBA. Descriptive statistics, one-sample proportions test, and chi-squared tests of independence were used to evaluate the three Research Questions.

The single sample proportions test was to determine if any significant differences in frequency of antenatal care, trained TBAs, and umbilical cord treatments existed between births within the six Nigerian provinces, whereas exploratory analysis for the differences in frequency between the variables was conducted. The chi-squared test of independence was conducted to determine if significant differences in frequency of antenatal care, trained TBAs, and umbilical cord treatments existed between births within six Nigerian provinces. The full details of these analyses were presented in Chapter 4, with the key findings summarized.

The results of this research show that the prevalence rate of NNT in the northeast region between January 2008 and December 2013 is 28.815%. There is no doubt that this figure is on the higher side considering the fact that a country gain certification as free from NNT when recorded cases is less than 1 per 1,000 live births per annum in every district of the country (UNICEF, WHO, UNFPA, 2000). Nevertheless, there is no study

in the past was able to establish the true NNT prevalence in the northeast region and Nigeria as a whole.

Additionally, this research shows some variations in the number of NNT cases between the six provinces. Borno province had the highest number (28%) of cases while Adamawa province had the lowest NNT cases 8%; these variations could be explained by the differences in socioeconomic background between the provinces in the region (NDHS, 2008).

The result revealed a decline in NNT cases starting from 2010 when the region had 26% with fewer cases 9% recorded in 2013. This could explain the measures that the Nigerian government is putting in place to meet with the 2015 global NNT elimination deadline (Awosika, 2000). This is as observed by Alhaji et al. (2013) and Onalo, Ishiaku, & Ogala (2011) that if the ongoing efforts of the Nigerian government is sustained, NNT elimination in the country will be a reality.

As indicated in this research, there were more male neonates with neonatal tetanus as compared with female neonates; the predominance of the male neonates is in agreement with other previous studies (Osinusi et al., 1986; Oruamabo et al., 1986; Ibadin, & Omoigberale, 1996; Okoromah et al., 2003). While reasons for the dominance of male neonates with NNT in this study could not be ascertained, this could partly be as a result of the socio-cultural preference given to the male child in the Nigerian community, which makes parents seek medical attention for the male child promptly (Alhaji et al., 2013).

Research Question 1

The purpose of Research Question 1 was to examine whether significant differences in the frequency of antenatal care existed between mothers that indicated receiving care and those that did not. This was evaluated using one-sample proportions test. The result indicates that a significant difference did exist in the frequency of receiving antenatal care between those that received care and those that did not. Thus, the null hypothesis was rejected in favor of the alternative hypothesis.

Alhaji et al. (2013) noted that the unacceptable high prevalence and mortality of NNT could be related to poor immunization coverage of mothers as only fewer mothers of NNT children had full immunization with the Tetanus toxoid. Similarly, this finding is supported by other studies (Ambe et al., 2009; Abhulimhen-Ihoha et al., 2011; Abdulkarim et al., 2011; Akani et al., 2004; Sani et al., 2010; Blencowe et al., 2010).

Research Question 2

The purpose of Research Question 2 was to examine using single sample proportions test whether significant differences in the frequency of receiving the attention from trained traditional birth attendants existed between mothers that indicated receiving treatment and those that did not. The result indicates that a significant difference did exist. Thus, the null hypothesis was rejected in favor of the alternative hypothesis. This finding is consistent with other research findings that delivery of newborn by untrained and unskilled traditional birth attendants (TBA) are factors to mothers giving birth to NNT babies (Blencowe et al., 2010; Afshar et al., 2011; Zafar et al., 2012; Sani et al., 2010).

Research Question 3

The purpose of Research Question 3 was to examine whether using single sample proportions test to determine if significant differences in frequency of umbilical cord treatments existed between mothers that indicated receiving treatment and those that did not. The result shows that a significant difference did exist, as mothers giving birth to NNT babies reported significantly fewer incidences of proper umbilical cord treatments. Thus, the null hypothesis was rejected in favor of the alternative hypothesis.

The findings from this research is supported by Alhaji et al. (2013), Blencowe et al. (2010), Afshar et al. (2011), Zafar et al. (2012), and Sani et al. (2010). In their studies, these authors showed that the unhygienic birth practices, cutting of the umbilical cord with unsterilized or contaminated sharp instruments, and treatment of the cord with a cow dung, ghee/surma or charcoal are contributing factors to neonates developing NNT. Similarly, other factors to the high prevalence include harmful cultural practices of caring for the umbilical cord such as hot fomentation, application of charcoal Ambe et al. (2009), Abhulimhen-Ihoha et al. (2011), and Abdulkarim et al. (2011).

Chi-Squared Tests

A chi-square test of independence was conducted to determine if significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within the six Nigerian provinces.

The result shows that there were significant differences in the frequencies of mothers that received antenatal care between Nigerian provinces and mothers that had their umbilical cord treated. This difference could be explained by the differences in

socioeconomic and cultural practices between various communities in the six provinces in the region (NDHS, 2008).

Similarly, there were nearly twice as many mothers that did not receive antenatal care as compared to those that did receive antenatal care. In the Borno province, 84% of the mothers did not receive ANC, and in the Taraba province, 67% did not receive antenatal care. This statistical finding further supports the differences in the availability of health facilities between the six provinces as shown during the NDHS survey of 2008.

Still, there were twice as many births in the six provinces where the umbilical cord was not treated properly as compared to births with cord treated properly. In the Borno province, 83% of the births did not receive cord treatment; in the Bauchi province, 73% did not receive cord treatment; and in the Gombe province, 68% of the births did not receive cord treatment. Finally, a significant difference in the frequency of mothers that were attended by a TBA was not found between provinces.

Limitations of the Study

Although secondary data received increased popularity especially in the conduct of quantitative research studies, these are not without some limitations due to some inherent challenges associated with its use. The main limitation was that the variables in this study were categorized slightly different form the variables in the NNT dataset. Thus, analyzing the NNT data that was previously collected not for the primary reason of this research was one important drawback. An example to this is that the data on treatment of umbilical cord, receiving antenatal care by mother, mother being attended by TBA, and diagnosing child as NNT were collected as numeric rather than as string variables.

Additionally, the data on the measure of NNT was collected as ordinal rather than nominal.

Other limitations included differences in purpose for the collection of the data, differences in the sampling criteria, and differences in the data collection processes; thus responses from the patients were probably influenced by some variables that were unknown to me. Additional limitations included dealing with missing data from the database, and difficulties in accessing, downloading and documenting the NNT database.

Recommendations

Although significant achievement has been recorded in the global NNT elimination campaign to reduce infant mortality deaths across the globe by 2015, NNT still remain among the leading causes of death in 25 developing countries with at least 355,000 cases of cases annually with resultant deaths of about 250,000 cases. The global NNT elimination initiative aims to reduce the disease to a level that is no longer a major public health problem by achieving the following: immunization of pregnant women and other WRA, practice of hygienic deliveries and clean cord care (UNICEF, WHO, UNFPA, 2000).

This research paves ways for future studies by public health experts and policy makers in Nigerian. First, there is a need to consider using national NNT database for a robust study to be able to establish a national prevalence for NNT, which is lacking. This would help the to know whether the efforts of the Nigerian government towards achieving the global NNT elimination goal is yielding the desired results. The outcome of the future research should serve as a gauge to assess whether the resources spent towards

the noble objective of the NNT elimination has helped the nation meet up to its obligation in addressing this preventable disease.

Secondly, the need for future studies should consider comparing the NNT prevalence between the northern and southern regions using regional NNT databases. The outcomes of this future research is expected to compare factors that influences mothers attend ANC and get vaccinated with the Tetanus toxoid vaccine, the cultural practices between the regions regarding care of the umbilical cords by mothers, and whether mothers in the southern region get attended to by the TBAs.

Finally, there is a need for future research to test the sensitivity of the NNT surveillance system across the country to be able to know whether NNT cases are being captured or missed. This is considering the importance of having a sensitive and reliable surveillance system in place to be able to detect and contend diseases rightly.

Implications

The findings from this study is expected to directly support healthcare providers professional practice and allow for practical application to create awareness about the importance of ANCs, to underscore the need for pregnant mothers to utilize ANCs and deliver in hospitals where possible, to underscore the need for policy makers to give quality training to additional health professionals, and to make adequate provision for health facilities to render ANC services to the hard-to-reach underserved communities. Additionally, the findings from this research would underscore to policy makers the need to share knowledge and borrow strategies from other African countries that hitherto had NNT, but achieved elimination. The finding is expected to show the need to build

capacity of the TBAs for safe home deliveries and hygienic handling the umbilical cord of newborns.

The social changes from the findings of this research is to enable the Nigerian government and policy-makers to strategize and ensure that women within the reproductive age group get vaccinated against tetanus so as to give passive immunity against NNT to their unborn children. Still, the social change from this study is expected to commit political leaders and influential people within the various communities in the northeast region to participate in immunization campaigns to increase ownership of the program and to clear the misconceptions that mothers have against the tetanus toxoid vaccine.

Finally, this study hopes to strengthen the knowledge base in health care related academia and influence/promote social change in the community by improving the health of pregnant mothers and newborns through the reduction of MNT. The findings are expected to guide health care policy makers and immunization program managers about ways to improve maternal and newborn health care services, to improve the health indicators of Nigeria, and help the country gain NNT elimination certification within the stipulated time frame.

Conclusion

Establishing the true prevalence of NNT in the northeast region of Nigeria has the potential to enable the government and policy makers evaluate the successes made towards achieving the global NNT elimination goal, which was reviewed to 2015. Although measures are well in place for the country to meet the 2015 dateline, there is

need to know what factors contribute to the increase of NNT in the country so that additional measures would be put in place to ensure that meeting the dateline of the global NNT elimination becomes a reality.

The main purpose of this secondary data analysis was to establish the prevalence of NNT in the northeast region, and to conduct single sample proportions test to determine if any significant differences in frequency of ANC, trained TBAs, and umbilical cord treatments existed between births within the six Nigerian provinces. This study indicates that NNT prevalence in the northeast region is unacceptably high. Additionally, the study shows that ways for the country to achieve the NNT elimination goals is to ensure that women within the childbearing age are fully vaccinated with the tetanus toxoid, pregnant women are delivered by trained TBAs, and that mothers of newborn children knows how to hygienically manage the umbilical of their babies.

As the global attention is increasing on improving maternal and child health care to reduce maternal and child mortality rates across the globe, there is a need for the Nigerian government to continue to strengthen the pillars that would ensure that it meets the 2015 dateline on global NNT elimination. The government should show increase commitment as well prioritize its activities towards ensuring that NNT in the country becomes a thing of the past, so that it will regain its role not just in Africa but in the comity of nations across the globe.

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Appendix A: NNT Case Investigation Form

CASE INVESTIGATION FORM – NEONATAL TETANUS

EPID Number _____ _____ Date received at Zonal/national level ____ ____ ____

IDENTIFICATION

LGA _____ State _____

Nearest health facility to village _____Neighborhood _____Town/City _____

Address _____

Name(s) of Patient _____ Mother _____

Sex 1. Male 2. Female Father _____

NOTIFICATION / INVESTIGATION

Notified by_____ _____Date case Notified ____ / ____ /____

MOTHER'S VACCINATION HISTORY

Mother vaccinated with TT? 1.Yes 2.No 9.Unknown

Number of doses _____ Ist ___/___/ ___ 4th ___ / ___ / ___

2nd___ ___ ___ 5th ___ ___ ___

3rd___ ___ ___ If >5 last dose___/___/____

Have card? 1.Yes 2.No 9.Unknown

Vaccination status of mother prior to delivery 1. Up to Date

2. Not up to date

9. Unknown

BIRTH OF INFANT

Date of Birth __ __ __Location of birth 1. Hospital 4. Home untrained attendant

2. Health Centre 5. Home, no attendant

3. Home trained attendant 9. Unknown

Cut cord with a sterile blade? 1. Yes 2. No 9. Unknown

Cord treated with anything 1. Yes 2. No 9. Unknown

Describe treatment of cord_____

Mother received antenatal care 1. Yes Where?_____If birth in institution, name of institution

2. No

9. Unknown

How many prenatal visits?___ Attended by doctor/nurse? 1.Yes 2. No 9. Unknown

Attended by a trained TBA/Midwife? 1. Yes (Give name)_____

2. No 9. Unknown

INITIAL CLINICAL HISTORY

Date onset of symptoms ___ ___ __Was baby normal at birth? 1. Yes 2.No 9.Unknown

Arched back:1.Yes 2. No 9. Unknown

Normal cry and suck during first 2 days? 1. Yes 2. No. 9. Unknown

Stopped sucking after 2 days? 1. Yes 2. No 9. Unknown

Age of onset in days ____(99=unknown) Stiffness? 1.Yes 2.No 9.Unknown

Complications? 1. Yes 2. No 9. Unknown

Age at death in days _____Spasms or Convulsions? 1.Yes 2. No 9.Unknown
Baby died? 1.Yes 2.No 9. Unknown

TREATMENT

Seen in OPD? 1.Yes 2.No 9.Unknown Admitted? 1. Yes 2. No 9. Unknown Date of admission_____

Medical number_____ Facility Address____

COMMENTS_____

RESPONSE

Mother given protective dose of TT within 3 months of report?

1. Yes 2. No 9. Unknown Date of response for supplemental__/__/__

Details of response_____

Supplemental immunization within same locality as the case? 1. Yes 2. No 9. Unknown_____

FINAL CLASSIFICATION OF THE CASE: **Neonatal Tetanus** 1. Yes 2.No 9. Unknown

Investigator: Name _____Title_____ Unit _____

Address _____Date: _____/_____/_____ Phone: _____

Appendix B: NNT Dataset

District	Province	Sex	DateOfBirth	CordTreatedwithanything	MotherReceivedantenatal	AttendedByTrainedTBAMidwife	Year	NeonatalTetanus
Fufore	Adamawa	F	7/24/09	1	2	2	2009	1
Fufore	Adamawa	F	11/8/12	2	2	2	2012	1
Ganye	Adamawa	M	3/9/13	2	1	9	2013	1
GOMBI	ADAMAWA	F	7/9/08	1	1	9	2008	1
Guyuk	Adamawa	F	10/2/11	1	2	2	2011	1
Mubi South	Adamawa	F	7/2/11	2	1	9	2011	1
Hong	Adamawa	F	2/20/11	2	1		2011	1
Hong	Adamawa	F	8/17/11	9	1	2	2011	1
Hong	Adamawa	M	12/3/12	9	9		2012	1
Lamurde	Adamawa	F	7/13/12	2	2	1	2012	1
Lamurde	Adamawa	M	10/16/12	2	1	1	2012	1
Maiha	Adamawa	M	8/28/12	1			2012	1
Maiha	Adamawa	F	2/1/13	1	2	2	2013	1
Madagali	Adamawa	F	8/31/12	9	2		2012	1
Numan	Adamawa	M	8/8/09	9	9	9	2009	1
Song	Adamawa	F	10/23/10	1	1	1	2010	1
Yola South	Adamawa	M	5/27/10	1	1	2	2010	1
Yola South	Adamawa	F	6/11/10	2	2	2	2010	1
Yola South	Adamawa	F	4/7/10	9	1	1	2010	1
Yola South	Adamawa	F	4/3/13	1	1	2	2013	1
Yola North	Adamawa	F	9/17/10	9	1	2	2010	1
Yola North	ADAMAWA	F	1/18/11	1	2	2	2011	1
Yola North	Adamawa	F	6/24/11	2	2	2	2011	1
Yola North	Adamawa	F	5/19/12	1	1	1	2012	1
Gombi	ADAMAWA	F	4/9/11	1	9	2	2011	1
Alkaleri	Bauchi	F	4/5/10	1	1	1	2010	1
Alkaleri	Bauchi	M	5/18/10	2	1	1	2010	1
Alkaleri	Bauchi	M	7/28/11	1	2	2	2011	1
Alkaleri	Bauchi	F	8/2/11	2	2		2011	1
Bauchi	BAUCHI	M	8/18/09	1	1	2	2009	1
Bauchi	Bauchi	M	9/14/10	1	2		2010	1
Bauchi	Bauchi	F	5/18/11	1	1	1	2011	1
Dass	Bauchi	M	8/7/10	2	2	2	2010	1
Damban	BAUCHI	F	6/15/09	1	1	1	2009	1
Damban	Bauchi	F	4/2/10	2	2		2010	1
Damban	Bauchi	M	6/29/11	2	2	2	2011	1
Damban	Bauchi	M	8/31/12	2	1	2	2012	1
Darazo	Bauchi	F	4/30/10	2	2	2	2010	1

Darazo	Bauchi	F	6/30/10	9	1	9	2010	1
Darazo	Bauchi	M	7/11/10	2	9	9	2010	1
Darazo	Bauchi	F	5/6/12	9	1	9	2012	1
Darazo	Bauchi	F	5/19/12	2	2		2012	1
Darazo	Bauchi	M	5/26/12	2	2		2012	1
Darazo	Bauchi	M	6/4/13	2	2		2013	1
Gamawa	Bauchi	M	10/20/10	1	2		2010	1
Gamawa	BAUCHI	M	5/24/11	2	2	2	2011	1
Ganjuwa	Bauchi	F	8/23/09	9	2	2	2009	1
Ganjuwa	Bauchi	M	8/26/09	9	1	2	2009	1
Ganjuwa	Bauchi	M	6/1/10	2	2	2	2010	1
Ganjuwa	Bauchi	M	2/13/11	1	2	2	2011	1
Ganjuwa	Bauchi	M	5/4/11	9	2		2011	1
Giade	Bauchi	M	2/2/10		2	2	2010	1
Giade	Bauchi	M	7/31/10	2	1	2	2010	1
Giade	Bauchi	M	10/10/10	2	2		2010	1
Giade	Bauchi	F	4/12/11	2	2	1	2011	1
Giade	Bauchi	F	6/26/12	2	1	1	2012	1
Giade	Bauchi	F	7/9/12	2	2		2012	1
Giade	BAUCHI	M	7/28/12	2	2	2	2012	1
Kirfi	Bauchi	M	10/20/09	2	2		2009	1
Kirfi	Bauchi	M	1/25/10	2			2010	1
Katagum	BAUCHI	M	9/16/09	2	2	2	2009	1
Katagum	Bauchi	M	10/10/09	1	2		2009	1
Katagum	Bauchi	M	12/5/09	2	2	2	2009	1
Katagum	Bauchi	M	8/10/10		1	1	2010	1
Katagum	Bauchi	M	3/1/11	2	1	1	2011	1
MISAU	BAUCHI	M	10/3/08		1	1	2008	1
Misau	BAUCHI	M	1/16/09	1	2		2009	1
Misau	Bauchi	M	3/16/10	2	2	9	2010	1
Misau	Bauchi	M	10/24/10	2	1	9	2010	1
Misau	Bauchi	M	5/12/12	2	1		2012	1
Ningi	Bauchi	F	12/3/09	2	2	2	2009	1
Ningi	Bauchi	M	4/26/11	9	1	9	2011	1
Ningi	BAUCHI	F		2			2013	1
Shira	Bauchi	M	8/1/11	2	2	2	2011	1
Tafawa-Balewa	Bauchi	F	10/25/09	9	1		2009	1
Tafawa-Balewa	Bauchi	M	6/23/10	1	2	2	2010	1
Tafawa-Balewa	Bauchi	M	8/10/10		1	2	2010	1
Toro	BAUCHI	M	7/22/09	2	2	2	2009	1
Toro	BAUCHI	M	8/2/09	2	2	2	2009	1
Toro	BAUCHI	F	5/20/11		2	1	2011	1
Itas/Gadau	Bauchi	M	9/7/09	1	2	2	2009	1
Itas/Gadau	Bauchi	F	7/21/10	1	1		2010	1

Itas/Gadau	Bauchi	M	8/15/10	2	2	2	2010	1
Warji	BAUCHI	M	7/11/09	2	1	2	2009	1
Zaki	Bauchi	M	12/13/09	2	2		2009	1
Zaki	Bauchi	F	6/23/11		1		2011	1
Zaki	Bauchi	M	7/7/11	2	1	1	2011	1
Damboa	Borno	M	6/25/10	2	2	2	2010	1
Bama	Borno	F	10/30/09	9	2		2009	1
Bama	Borno	M	10/28/09	9	2		2009	1
Bama	Borno	M	11/25/09	2	2	9	2009	1
Bama	Borno	F	11/27/09	9	2	9	2009	1
Bama	Borno	F	2/2/10	2	2		2010	1
Bama	Borno	M	2/6/10	2	2		2010	1
Bama	Borno	F	3/9/10	9	2		2010	1
Bama	Borno	M	3/13/10	9	2		2010	1
Bama	Borno	M	4/24/10	9	2	2	2010	1
Bama	Borno	M	4/23/10	9	2	2	2010	1
Bama	Borno	F	5/8/11	9	2	2	2011	1
Bama	Borno	M	5/9/11	9	2	2	2011	1
Bama	Borno	F	5/6/11	9	2	2	2011	1
Gwoza	Borno	M	4/14/10	2	2	2	2010	1
CHIBOK	BORNO	M	2/4/08	1	2		2008	1
Chibok	BORNO	F	4/8/09	2	1		2009	1
Chibok	Borno	F	7/18/13		1		2013	1
Chibok	Borno	M	7/12/13	2	2	2	2013	1
DAMBOA	BORNO	F	7/1/08	9	1	9	2008	1
Damboa	BORNO	M	5/7/09	2	2		2009	1
Damboa	Borno	M	8/6/09	2	2		2009	1
Damboa	Borno	M	7/24/09	2			2009	1
Damboa	Borno	F	6/13/09	2	2	2	2009	1
Damboa	Borno	M	7/25/09	2	2	2	2009	
Damboa	Borno	F	8/4/09	2	2	2	2009	1
Damboa	Borno	F	9/3/09	2	2		2009	1
Damboa	Borno	F	9/1/09	2	2	2	2009	1
Damboa	Borno	F	9/6/09	2	2	2	2009	1
Damboa	Borno	F	9/10/09	2	1		2009	1
Damboa	Borno	F	9/22/09	2	2	2	2009	
Damboa	Borno	F	9/22/09	2	2	2	2009	
Damboa	Borno	M	9/22/09	2			2009	1
Damboa	Borno	M	10/2/09	2	2		2009	1
Damboa	Borno	M	10/10/09	2	2		2009	1
Damboa	Borno	M	10/4/09	2	2		2009	1
Damboa	Borno	M	10/10/09	2			2009	1
Damboa	Borno	M	1/27/10	2	2		2010	1
Damboa	Borno	M	6/19/10	2	2	2	2010	1
Damboa	Borno	M	6/25/10	2	2	2	2010	1

Damboa	Borno	F	6/20/10	9	2	2	2010	1
Damboa	Borno	F	7/11/10	2	2	2	2010	1
Damboa	Borno	F	7/10/10		2	9	2010	1
Damboa	Borno	M	7/14/10		2	2	2010	1
Dikwa	Borno	M	7/5/09	2	2	1	2009	1
Guzamala	Borno	M	2/10/10	2	9	9	2010	1
Guzamala	Borno	F	3/11/13	2	2		2013	1
Guzamala	Borno	F	3/21/13	2	2		2013	1
Gubio	BORNO	M	10/13/08	2	2		2008	1
Gubio	BORNO	F	10/14/08		2		2008	1
Gubio	BORNO	F	1/12/09		2	2	2009	1
Gubio	Borno	F	9/12/09	2	2	2	2009	1
Gwoza	BORNO	M	12/31/08	1	1	1	2009	1
Gwoza	Borno	M	4/13/10	1	2	9	2010	1
JERE	BORNO	F	6/1/08	1	2		2008	1
Jere	Borno	F	5/6/11	2	2	9	2011	1
Jere	Borno	F	2/24/12	2	1	1	2012	1
Jere	Borno	F	1/29/12	2	1		2012	1
Jere	Borno	M	2/3/12	2	2		2012	1
Jere	Borno	F	9/16/13		2		2013	1
KONDUGA	BORNO	M	5/29/08	9	2		2008	1
Konduga	BORNO	F	4/29/09	9	2	2	2009	1
Konduga	BORNO	F	2/1/12	2		2	2012	1
KAGA	BORNO	M	5/4/09	2	2	2	2009	1
KAGA	Borno	M	2/7/10	2		2	2010	1
KAGA	BORNO	M	2/22/11	1	2	2	2011	1
KWAYA KUSAR	BORNO	F	3/5/08	9	1		2008	1
KWAYA KUSAR	BORNO	M	4/30/08	1	2		2008	1
Kwaya Kusar	BORNO	F	12/20/08	9	2		2008	1
MAFA	BORNO	M	5/10/08		2	2	2008	2
Mafa	Borno	M	3/8/10		2	2	2010	1
Mafa	Borno	M	5/10/13	2			2013	1
Mafa	Borno	M	5/2/13	2	2	1	2013	1
Marte	BORNO	F	8/1/08				2008	1
Marte	BORNO	M	9/5/08	2	2	1	2008	1
Marte	BORNO	F	10/2/08	2	2	1	2008	1
Marte	BORNO	M	8/25/08	9			2008	1
Marte	BORNO	M	10/25/08	1	2	2	2008	1
Marte	BORNO	F	2/10/09	1	1	2	2009	1
Marte	Borno	M	5/2/10	2	1	1	2010	1
Marte	Borno	M	7/1/10	2	2	2	2010	1
Marte	Borno	M	7/11/10	1	2	2	2010	1
Marte	Borno	F	3/2/13	1	1	2	2013	1
Monguno	BORNO	M	2/11/09		2		2009	1

Ngala	Borno	M	7/28/11	2	2	2	2011	1
NGANZAI	BORNO	M	2/29/08	2	1		2008	1
AKKO	Gombe	M	9/29/08		2		2008	1
Akko	Gombe	F	6/5/09	2	1		2009	1
Akko	Gombe	M	3/1/10	2	2	2	2010	1
Akko	Gombe	F	6/4/10	9	2	2	2010	1
Akko	Gombe	M	9/10/10	1	1		2010	
Akko	GOMBE	M	4/18/11	2	2	2	2011	1
Akko	Gombe	M	3/22/13	2	2	2	2013	1
Balanga	Gombe	M	2/24/12	2	1	1	2012	1
Balanga	Gombe	F	2/20/10	2	1	1	2010	1
Balanga	Gombe	M	8/4/11	2	2	1	2011	1
Balanga	Gombe	M	2/24/12	2	1	1	2012	1
Balanga	Gombe	F	5/14/13	2	2	2	2013	1
Balanga	Gombe	F	5/22/13	2	2	2	2013	1
Billiri	Gombe	F	3/13/12		1		2012	1
FUNAKAYE	Gombe	F	8/19/08	2	2	2	2008	1
Funakaye	Gombe	M	10/8/08	1	1	2	2008	1
Funakaye	Gombe	M	6/13/09	1	1		2009	1
Funakaye	Gombe	M	10/24/09	2	2	2	2009	1
Funakaye	Gombe	F	3/28/11	1	2	2	2011	1
Funakaye	Gombe	M	8/27/12	2		2	2012	1
Funakaye	Gombe	F	8/24/12	9	1	2	2012	1
Funakaye	Gombe	M	8/3/13		2		2013	1
Gombe	GOMBE	F	5/2/11	2	1	2	2011	1
Gombe	Gombe	F	2/14/12	1	1	1	2012	1
Gombe	Gombe	M	8/11/12	1	2		2012	1
Gombe	Gombe	F	2/21/13	1	1		2013	1
Gombe	Gombe	M	8/11/13	1			2013	1
Gombe	Gombe	M	9/6/10	1	1		2010	
Kaltungo	Gombe	M	6/7/10	2	2	2	2010	1
Kaltungo	GOMBE	F	4/15/11	2	1	2	2011	1
Kwami	Gombe	M	4/14/10	2	1	9	2010	1
Kwami	Gombe	F	6/13/10	2	2	2	2010	1
Kwami	Gombe	M	5/15/11	2	1	1	2011	1
Kwami	Gombe	M	6/24/11	1	2	2	2011	1
Kwami	Gombe	M	3/11/12	1	1		2012	1
Kwami	Gombe	M	7/29/12	2	2		2012	1
Kwami	Gombe	M	7/29/12	2	2		2012	1
Kwami	Gombe	M	8/8/13	1	1		2013	1
Nafada	Gombe	M	2/21/10	9	1		2010	1
Nafada	Gombe	M	10/25/13	2	1		2013	1
Shomgom	Gombe	F	4/10/09	2	1	1	2009	1
Shomgom	Gombe	M	6/5/12	9	1		2012	1
Shomgom	Gombe	M	9/20/12		1		2012	1

Yamaltu/Deba	Gombe	M	2/17/09	2	1		2009	1
Yamaltu/Deba	Gombe	M	5/30/09	1	1	1	2009	1
Yamaltu/Deba	Gombe	F	6/19/10	2	1	1	2010	1
Yamaltu/Deba	Gombe	M	5/9/11		2	1	2011	1
Yamaltu/Deba	Gombe	F	5/17/11		1	1	2011	1
Yamaltu/Deba	Gombe	F	5/19/11	2	2		2011	1
Yamaltu/Deba	Gombe	M	8/1/11	2	2		2011	1
Yamaltu/Deba	Gombe	M	6/18/12	9	2		2012	1
Yamaltu/Deba	Gombe	F		9	9		2012	1
Yamaltu/Deba	Gombe	M	3/16/13	2	1		2013	1
Bali	Taraba	M	2/16/09	9	1	9	2009	1
Bali	Taraba	F	2/14/09	1	2	9	2009	1
Bali	Taraba	F	6/25/09	9	1	1	2009	1
Bali	Taraba	F	5/21/10	2	1	1	2010	1
Bali	Taraba	F	5/22/10	2	1	2	2010	1
Bali	Taraba	F	8/28/10	2	2	1	2010	1
Bali	Taraba	M	8/30/10	2	2	1	2010	1
Bali	Taraba	F	8/31/10	1	1	1	2010	1
Bali	Taraba	F	3/1/12	2	2	1	2012	1
Bali	Taraba	F	5/31/12	1	1	1	2012	1
IBI	Taraba	M	1/23/09	2	2	2	2009	1
IBI	Taraba	F	2/19/09		2	2	2009	1
Donga	Taraba	M	10/9/08	9	2	9	2008	1
Donga	Taraba	M	10/12/08	1	1	1	2008	1
Donga	Taraba	F	1/17/09	9	2		2009	1
Donga	Taraba	F	3/26/09	9	2	1	2009	1
Donga	Taraba	F	6/5/10	9	2	2	2010	1
Donga	Taraba	M	6/8/10	9	2	2	2010	1
Donga	Taraba	M	2/9/11	2	1	2	2011	1
Donga	TARABA	M	4/24/11	9	2	9	2011	1
Donga	Taraba	F	10/3/11	1	2	2	2011	1
Donga	Taraba	M		1	2	2	2012	1
Donga	Taraba	F	3/17/12	1	2	2	2012	1
Donga	Taraba	M	6/25/12	1	2	2	2012	1
Donga	Taraba	F	7/9/12	2	2		2012	1
Donga	Taraba	F	10/30/12	2	2	2	2012	1
Donga	Taraba	F	1/12/13	1	2	2	2013	1
Donga	Taraba	F	3/23/13	1	2	2	2013	1
Gashaka	Taraba	F	7/21/09	2	2	2	2009	1
Gashaka	Taraba	M	10/12/09	2	2		2009	1

Gashaka	Taraba	F	12/29/09	2	1	1	2010	1
Gashaka	Taraba	M	4/21/12	1	2	2	2012	1
Gashaka	Taraba	M	3/22/13	2	2	2	2013	1
Jalingo	Taraba	M	3/30/09	1	1		2009	2
Kurmi	Taraba	F	3/18/10	2	2	1	2010	1
Kurmi	Taraba	F	3/2/13	2	2	2	2013	1
Kurmi	Taraba	M	3/22/13	2	2	2	2013	1
Lau	Taraba	F	6/25/10		1	1	2010	1
Lau	Taraba	F	8/1/10	1	2	2	2010	1
Sardauna	Taraba	M	2/7/10	2	2	2	2010	1
Takum	Taraba	F	3/23/09	9	2	2	2009	1
Takum	Taraba	M	5/2/09	9	2	2	2009	1
Takum	TARABA	M	10/3/11	2	2	2	2011	1
Takum	Taraba	M	9/5/12	1	1	1	2012	1
Zing	Taraba	M	3/24/10	2	1		2010	1
Zing	Taraba	F	10/16/12	2	2	2	2012	1
Ussa	Taraba	M	3/3/10	2	1	9	2010	1
Ussa	Taraba	F	6/23/11	1	1	1	2011	1
Ussa	Taraba	M	9/9/13	1	1	1	2013	1
Wukari	Taraba	M	11/30/08	2	1	1	2008	1
Wukari	Taraba	F	3/23/09	2	1		2009	1
Wukari	Taraba	M	7/8/10	1	2	2	2010	1
Wukari	Taraba	M	7/14/10	1	2	2	2010	1
Yorro	Taraba	M	9/24/09	1	2	2	2009	1
Yorro	Taraba	F	2/1/10	9	2	2	2010	1
Damaturu	Yobe	M	7/8/09	9	9	9	2009	1
Damaturu	Yobe	M	7/9/09	9	1	9	2009	1
DAMATURU	YOBE	F	1/5/08	9	9	9	2008	1
DAMATURU	YOBE	M	1/9/08	9	9		2008	1
DAMATURU	YOBE	M	2/28/08		1		2008	1
DAMATURU	YOBE	M	2/23/08	9	9	9	2008	1
DAMATURU	YOBE	M	7/29/08	9			2008	1
DAMATURU	YOBE	M	7/29/08	9			2008	1
DAMATURU	YOBE	M	7/18/08	9			2008	1
DAMATURU	YOBE	M	7/22/08	9			2008	1
DAMATURU	YOBE	F	8/12/08	9	9	9	2008	1
DAMATURU	YOBE	M	8/15/08	9		9	2008	1
Damaturu	YOBE	F	10/25/08	9	9	9	2008	1
Damaturu	YOBE	M	11/14/08	9	9	9	2008	1
Damaturu	YOBE	M	3/2/09	9	9	9	2009	1

Damaturu	YOBE	M	7/8/09	9	9	9	2009	1
Damaturu	YOBE	M	7/9/09	9	1	9	2009	1
Damaturu	Yobe	M	3/25/10	9	9	9	2010	1
Damaturu	Yobe	F	5/6/10	9	9	9	2010	1
FIKA	YOBE	M	6/8/08	9	2		2008	1
Fika	Yobe	M	8/20/09	9	9	9	2009	1
Fune	Yobe	M			1		2013	1
Geidam	Yobe	M	8/23/10	9		2	2010	1
Geidam	Yobe	F	9/27/10	9		9	2010	1
Geidam	Yobe	M	9/30/10	9		2	2010	1
Gujba	Yobe	M	4/24/11	1	1	1	2011	1
Gujba	Yobe	F	5/7/11	1	2	9	2011	1
Karasuwa	Yobe	M		2	2	9	2010	1
Nguru	Yobe	M	9/16/09	2	2	2	2009	1
Nguru	Yobe	M		2	1	9	2010	1
Nguru	Yobe	M	11/10/10	1	2	9	2010	1

Appendix C: Permission to Use Data

Dear Dr. Jalal Saleh:

You may please go ahead to use the NNT data for your Doctoral Dissertation.

However, further consent should be sought in the event of publishing the outcome of your research.

Wishing you good luck in your dissertation.

U. S. Adamu, MD

U. S. Adamu, MD
Zonal Coordinator (North East Zone) NPHCDA

Appendix D: IRB Materials Approval

Dear Mr. Saleh,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "Prevalence of neonatal tetanus in northeastern Nigeria," meets Walden University's ethical standards. Our records indicate that you will be analyzing data provided to you by National Primary Healthcare Development Agency/World Health Organization as collected under its oversight. Since this study will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. The IRB approval number for this study is 09-05-14-0430034.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted toIRB@waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden web site:
http://researchcenter.waldenu.edu/Application-and-General-Materials.htm

Researchers are expected to keep detailed records of their research activities (i.e., participant log sheets, completed consent forms, etc.) for the same period of time they retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Libby Munson
Research Ethics Support Specialist
Office of Research Ethics and Compliance
Email: irb@waldenu.edu
Fax: 626-605-0472
Phone: 612-312-1341
Office address for Walden University:
100 Washington Avenue South
Suite 900
Minneapolis, MN 55401

Curriculum Vitae

DR. JALAL-EDDEEN A. SALEH, MPH

CAREER SUMMARY

An enthusiastic, teamwork player, self-motivated, and work well under pressure; wide range of experience in immunization, disease prevention and control; wide range of experience working in public and international organizations; effective interpersonal skills (oral and written communication); strong documentation and advocacy skills; people management skills - team building; effective planning and organizing skills; well proficient in the use of Internet and relevant Microsoft Office applications; excellent use of statistical packages (especially SPSS).

PROFESSIONAL EXPERIENCE

World Health Organization ***National STOP Consultant - Nov. 2011 – Dec. 2014***

- Plan, implement and monitor immunization activities aimed at improving population immunity against polio and other vaccine preventable diseases.
- Plan, implement and monitor immunization activities aimed at quality integrated measles campaign.
- Plan, implement and monitor disease surveillance, targeting vaccine preventable diseases and other priority diseases in the context of integrated disease surveillance and response.
- Plan and implement capacity-building activities for health workers and other service providers involved in immunization and surveillance activities.
- Coordinate activities of different partners and stakeholders, including community-based organizations, community groups, etc. involved in improving population immunity against polio and other vaccine preventable diseases.
- Perform other activities such as reporting of Integrated Disease Surveillance and Response (IDSR), and preparing response to Epidemics and other public health events of international concern in the northeast zone.

Hospital Service Mgt. Board, Adamawa, Nigeria ***Chief Medical Officer (May 1994 – May 2012)***

- Engage in defining the overall public health/clinical decision of patient management
- Lead the overall public health/clinical vision for the hospital, and to provide public health/clinical directions to the Health Management

- Provide medical oversight, expertise and leadership that would ensure the delivery of affordable quality healthcare services
- Develop and create strategies towards innovative public health/clinical programs that include collaboration with other health care providers

EDUCATION

Walden University **Minneapolis, Minnesota, U.S.A.**
Doctor of Philosophy, Public Health – Epidemiology
Expected December 2014
Dissertation: Prevalence of Neonatal Tetanus in northeast Nigeria

London School Of Hygiene and Tropical Medicine **London, United Kingdom**
Master of Public Health
November 2011

Imperial College London **London, United Kingdom**
Diploma in Internal Medicine
November 2004

University Of Maiduguri **Maiduguri, Nigeria**
Bachelor of Medicine, Bachelor of Surgery
May 1994

PROFESSIONAL DEVELOPMENT/SHORT COURSES

WHO mid-level management training on Polio Eradication Initiatives
December 2012
United Nations Basic security in the field II
May 2012
United Nations Basic security in the field I
December 2011
United Nations Advanced security in the field
December 2011
Diabetes and coronary heart disease
November 2003

AFFILIATIONS

Royal Society for Public Health, United Kingdom - Fellow
Royal Society for Tropical Medicine & Hygiene, United Kingdom - Fellow
American Society for Tropical Medicine & Hygiene – Student Member
American Public Health Association – Student Member

American College of Epidemiology – Associate member
International Society for Disease Surveillance - Member
Collaboration on Health & Environment - Individual Member
Nigeria Medical Association - Member
Nigerian Institute for Management Consultants - Member
Nigerian Institute for Human and Natural Resources - Fellow
Nigeria Institute for Management - Member

HONORS/AWARDS

Golden Key International Society, USA - Honors Award
World Health Organization - Accomplishment Award on Accountability Framework
HSMB Adamawa State, Nigeria - Accomplishment Award

PUBLICATIONS

- TB in HIV patients: how to strengthen control measures (*Nigerian Medical Practitioner,* vol. 59, No. 5-6, pp 56-61) doi: http://dx.doi.org/10.4314/nmp.v59i5-6.70363
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