

# Neonatal Tetanus At The Niger Delta University Teaching Hospital: A 5 Year Retrospective Study

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## Abstract

### Background

: Neonatal tetanus (NNT) though preventable, remains a significant cause of morbidity and mortality in developing countries like Nigeria. Objective: A study was carried out in the Paediatrics unit of the Niger Delta University Teaching Hospital (NDUTH), Bayelsa State, Nigeria to highlight the burden of NNT in the state and proffer solutions which may be useful in its eradication. Methodology: Over a 5 year period (from May 2007 to April 2012), all cases of NNT admitted into the Paediatrics unit of the NDUTH were retrospectively studied. Results: A total of 4780 children were admitted during the study period. Neonatal tetanus accounted for 40 (0.84%) of these admissions, with a male to female ratio of 1:2, and a mean age of 8.3 days. Thirty four (77.3%) of the mothers had no antenatal care and delivered outside health facilities. Razor blade was used to cut the umbilical cord in 37.5% of the cases and hair thread was used to tie the cord in 15.0%. Seventeen (42.5%) of the mothers had no formal education. Fifteen of the 40 patients died, giving a case fatality rate of 37.5%. The case fatality rate for males (46.2%) was higher than that for females (33.3%). NNT accounted for 3.5% of all Paediatric deaths and 9.0% of neonatal deaths. Conclusion: NNT is still a significant cause of morbidity and mortality in this environment. Efforts aimed at eradication of this social scourge should be intensified and more efforts should be geared towards improving the anti-tetanus vaccine coverage rate of all women even before they get to child bearing age.

## INTRODUCTION

Tetanus is a disease of the nervous system caused by exotoxins of *Clostridium tetani*, a gram positive anaerobic bacteria.<sup>1</sup> The exotoxin produced at the inoculation site inhibits cholinesterase at the motor end plates resulting in muscle spasms.<sup>1</sup> The exotoxin also travels along the nerves to the central nervous system, causing motor neuron hyperexcitability with eventual widespread muscle spasms which can either be spontaneous or in response to sensory stimuli.<sup>1</sup> In spite of simple preventive measures available, tetanus remains a major cause of mortality in the developing countries.<sup>2</sup>

Neonatal tetanus (NNT) mostly results from unhygienic birth practices that expose the umbilical cord to the tetanus organism.<sup>3</sup> It is most common in countries where access to basic health services is limited and hygienic conditions are poor.<sup>3</sup> Globally NNT accounts for 7% of neonatal deaths<sup>4</sup> with Nigeria accounting for 16% of this global burden.<sup>5</sup> The incidence of NNT in Nigeria ranges from 14.6 to 20 per 1000 live births<sup>6</sup> and accounts for about 20% of neonatal

deaths.<sup>7</sup>

Neonatal tetanus is completely preventable by immunizing females before or during pregnancy or by ensuring clean delivery, with proper and hygienic cord care at birth and the days following birth.<sup>3</sup> Low tetanus toxoid vaccine rates and delivery by untrained personnel have been identified as major contributors to the persistently high incidence of NNT in Nigeria.<sup>3,5</sup> One major step taken to address the problem of poor vaccine coverage in Nigeria was the replacement of the Expanded Programme of Immunization (EPI) with the National Programme on Immunization (NPI) in 1997.<sup>8</sup> However, Fetuga et al<sup>9</sup> at Sagamu found no significant differences in the prevalence and case fatality rates of NNT in spite of the change in immunization programme.

Data generated on the burden of NNT in Nigeria will help in the assessment of the impact of the National Immunization Programme as well as in planning intervention programmes aimed at eradicating this social scourge. However, NNT is under reported in Nigeria with only about 5% of cases reporting to health facilities.<sup>5</sup> There are several published

studies on NNT in other parts of Nigeria<sup>3,9,10-14</sup> but none from Bayelsa State in the Delta region. This study was therefore carried out in the Niger Delta University Teaching Hospital of Bayelsa State to highlight the burden of NNT in the State and also proffer solutions which may help in its eradication.

## **METHODOLOGY**

### **STUDY CENTER**

The study was carried out at the Niger Delta University Teaching Hospital (NDUTH), which is a tertiary hospital at Okolobiri town, a semi-urban region of Bayelsa state, Nigeria. Bayelsa, is a state in the Niger Delta region of Nigeria, its neighboring states are Rivers and Delta states. The number of tetanus cases seen at the NDUTH may be representative of all cases of tetanus that present to health centres in the state since all cases of tetanus from other Health centers in the state are referred there.

### **DATA COLLECTION**

All cases of neonatal tetanus admitted into the Paediatrics Department of the Niger Delta University Teaching Hospital (NDUTH) during a five year period, from May 2007 to April 2012, were retrospectively studied. The folder numbers of the patients were retrieved from the ward register.

The folders were retrieved from the records department of the NDUTH. Information obtained from folders were collected into a pro-forma. The information included; the patients personal data, pregnancy and birth history, outcome, mother's and immunization history, onset interval, age at first onset of symptoms, interval between first symptom and presentation at the hospital. Other data collected included the age at admission, method of treatment at home before presentation in the hospital, mother's antenatal care, place of delivery, instrument used to cut cord, material used to tie or clamp cord, method of cord care and educational level of mother.

The onset interval was taken as the time interval (in days) between the first symptom (cessation of sucking) and occurrence of spasms.

### **CRITERIA FOR CLINICAL DIAGNOSIS**

The clinical findings of all the patients were compatible with tetanus according to the WHO diagnostic criteria<sup>15</sup> with all 3 of the following:

Normal feeding and crying during the first 2 days of life;

Onset of illness between 3 and 28 days;

Inability to suck (trismus), followed by stiffness (generalized muscle rigidity) and/or muscle spasms.

### **TREATMENT PROTOCOL**

All cases of tetanus were admitted into the side room of the Children's ward where minimal external stimuli were ensured. They all received anti-tetanus serum at 10,000 to 30,000 IU and intravenous metronidazole. Spasms were controlled with a combination of oral chlorpromazine, phenobarbitone and diazepam via a nasogastric tube. Intramuscular paraldehyde was given for break through spasms. They were fed with expressed breast milk via a nasogastric tube. Intramuscular paraldehyde was given for break through spasms. A spasm chart was kept and the doses of the sedatives adjusted accordingly depending on whether the spasms were increasing or reducing.

### **ETHICAL CONSIDERATION**

Ethical clearance was sought and obtained from the research and ethics committee of the NDUTH.

### **DATA ANALYSIS**

Data was analyzed using Microsoft excel 2010 and Epi-info statistical package. Test of significance between proportions was assessed using Chi-square, and a p value of 0.05 or less was considered significant at a 95% confidence interval.

### **RESULTS**

During the 5 year period under review, a total of 4780 children were admitted into the Paediatric wards, of which 858 (17.9%) were neonates. Forty (0.84%) of the total admissions had neonatal tetanus. Among the neonates, 40 (4.7%), 13 males and 27 females had neonatal tetanus giving a male to female ratio of 1:2.

The ages of patients with NNT ranged from 3-27days with a mean age of 8.3days (table 1). More patients 26 (65.0%) were aged 3-7days, 7 (17.5%) were 8-12 days old, while the rest presented between 13 and 27 days of life.

### **YEARLY PREVALENCE FOR NNT CASES**

As shown in table 2, there was a decrease in the number of NNT cases from May 2010 to April 2012 as compared to the period from May 2007 to April 2010.

Mothers antenatal history: Thirty four (77.3%) of the mothers had no antenatal care and delivered outside health facilities. Twenty two (55.0%) of the deliveries were supervised by traditional birth attendants (TBAs), 2 (5.0%) delivered in the church, supervised by Christian sisters while

one (2.5%) delivered at home. Six (15.0%) of the mothers had antenatal care and delivered in health centres (2 were supervised by doctors and 4 by nurses).

Instrument used to cut the umbilical cord: of the 40 cases of NNT, razor blade was used to cut the umbilical cord in 15 cases (37.5%) while scissors was used in 4 cases (10%), in 10 cases (25%) the instrument used to cut the cord was unknown, while in 11 cases (27.5%) the instrument used to cut the umbilical cord was not documented.

Material used to tie the umbilical cord: hair thread was used to tie the umbilical cord in 6 (15.0%) of the patients, while cord clamp was used in 5 cases (12.5%). Silk suture and sewing thread were used in 2 (5%) of the patients respectively while in 5 (12.5%) of the patients, the material used to tie cord was unknown. In 20 (50%) of the patients the material used to tie the umbilical cord was not documented.

Method of cord care: pieces of clothing dipped in warm water was used to clean the umbilical cord in 14 (35.0%) while cotton wool and methylated spirit was used in 6 (15.0%) of the patients with toothpaste and metholatum balm in 1 (2.5%) of the patients respectively. In 18 (45%) of the patients, the method of cord care was not documented.

Mothers level of education: Of the 40 patients with NNT, 17 (42.5%) of their mothers had no formal education, 7 (17.5%) had primary education while 4 (10.0%) had secondary education. The mothers level of education was not documented in 18 (45.0%) of the cases.

Intervention at home before presentation to the hospital: ten (25.0%) of the patients had massage and scarification marks, 5 (12.5%) were massaged only, 8 (20.0%) were taken to a drug store were some injections and drugs were give, 4(10.0%) were given some native concotions, 1 (2.5%) case was treated with ground onions which was squeezed into her eyes and mouth. Home treatment was not documented in 12 (30%) cases.

Outcome of the 40 NNT cases: Of the 4780 patients admitted during the study period, 425 (8.9%) died with NNT accounting for 15 (3.5%) of the deaths. Of the 858 neonatal admissions, 167 (19.5%) died with NNT accounting for 15 (9.0%) of the total neonatal deaths.

Table 3 shows that 15 of the 40 patients with NNT died giving a case fatality rate of 37.5%. Of the 13 males with NNT, 6 died giving a male case fatality rate of 46.2% while

9 of the 27 female died giving a female case fatality rate of 33.3%. This difference was not statistically significant  $\chi^2 = 0.19, p = 0.663$ .

Most deaths 13(86.5%) occurred amongst those aged 3-7days, 1 death (6.7%) occurred amongst neonates aged 8-12days and 1 death (6.7%) amongst those aged 18-22days.

Twenty one patients (52.5%) got better and were discharged while 4 (10.0%) were taken away against medical advice.

**RELATIONSHIP BETWEEN ONSET INTERVAL, AND NUMBER OF DEATHS**

Table 4 shows that more deaths 10 (55.5%) occurred amongst the 18 cases with ages of onset between 4-6days, followed by those with onset interval between 1 to 3 days (30.0%).

**RELATIONSHIP BETWEEN TIME INTERVAL BETWEEN FIRST SYMPTOM AND PRESENTATION AT THE HOSPITAL AND NUMBER OF DEATHS**

As shown in table 5, the case fatality rate for the patients who presented to the hospital within 7 to 9 days of onset of symptoms was higher (60.0%) than those who presented within 4 to 6 days (44.4%) which in turn was higher than the case fatality for those who presented within 1 to 3 days. The difference was however, not statistically significant,  $\chi^2 = 0.97, p = 0.61$

**Figure 1**

Table 1: Distribution of NNT cases by age

Age in days	Males	Females	Total (%)
3-7	8	18	26(65.0)
8-12	3	4	7 (17.5)
13-17	1	2	3 (7.5)
18-22	1	2	3 (7.5)
23-27	0	1	1 (2.5)
<b>Total</b>	<b>13</b>	<b>27</b>	<b>40 (100.0)</b>

**Figure 2**

Table 2: Yearly prevalence for NNT cases

Time period	No of cases admitted
May 2007 - April 2008	13
May 2008 - April 2009	9
May 2009 - April 2010	10
May 2010 - April 2011	5
May 2011 - April 2012	6

**Figure 3**

Table 3: Outcome of the 40 NNT cases

Age in days	No (%) n=40	Discharged	DAMA	Died		Died (%) n=15
				M	F	
3-7	26 (65.0)	10	3	5	8	13 (86.7)
8-12	7 (17.5)	5	1	0	1	1(6.7)
13-17	3 (7.5)	3	0	0	0	0(0.0)
18-22	3 (7.5)	2	0	1	0	1(6.7)
23-27	1 (2.5)	1	0	0	0	0(0.0)
28	0 (0.0)	0	0	0	0	0(0.0)
<b>Total</b>	<b>40 (100.0)</b>	<b>21</b>	<b>4</b>	<b>6</b>	<b>9</b>	<b>15(100.0)</b>

DAMA: discharge against medical advice

**Figure 4**

Table 4: Relationship between onset interval and number of deaths.

Onset interval	No. of cases	No. of deaths	% no. of deaths
1-3 days	10	3	30.0
4-6 days	18	10	55.5
7-9 days	8	2	25.0
10-12 days	4	0	0.0

**Figure 5**

Table 5: Relationship between time interval between first symptom and presentation at the hospital and number of deaths.

Interval between first symptom and presentation in the hospital.	No. Of cases seen (n=40)	No. of deaths (%)
1-3 days	22	8 (36.4)
4-6 days	9	4 (44.4)
7-9 days	5	3 (60.0)
10-12 days	3	0 (0.0)
13-15 days	1	0 (0.0)

**DISCUSSION**

The results of the present study showed that neonatal tetanus accounted for 0.84% of the total Paediatric admissions and 4.7% of neonatal admissions. This is more than double the 0.4% percentage total Paediatrics admission rate reported by Emodi et al<sup>11</sup> in Enugu over a 10 year period. Though the reason for this difference is not clear, it may be because accessibility to health centres is more of a challenge in Bayelsa State as compared to Enugu State as about 50% of the communities in the former are in riverine areas where individuals have to travel by boat to get to functional health centres. Onalo et al<sup>14</sup> in Zaria reported a similar hospital prevalence rate of 0.7% over a 4 year period while Ejike et al<sup>13</sup> reported a much higher rate of 1.9% at Aba, over a 3 year period. Fetuga et al<sup>9</sup> in Sagamu reported a similar neonatal admission prevalence rate of 4.2%. In more developed countries like the United States of America, only 2 cases of NNT were reported from 1992 to 2000<sup>16</sup> while no case was reported in the United Kingdom from 1984 to 2000.<sup>17</sup>

There were more females in the present study with a male to female ratio of 1:2. This is different from other studies in other parts of Nigeria<sup>9,10,14</sup> where males were more than females. However, Emodi et al<sup>11</sup> at Enugu found an equal sex ratio among patients with NNT.

There was a decrease in the number of cases from May 2010 to April 2012 as compared to the period from May 2007 to April 2010. Mondal et al<sup>18</sup> in Delhi India also found a modest decline in admissions due to tetanus from 1986 to 1991 while Dikici et al<sup>19</sup> in Turkey showed a tremendous decrease in incidence between 1996 and 2006. Emodi et al<sup>11</sup> at Enugu however, reported an upsurge in NNT cases from 2001 to 2006. They explained this increase with the fact that

during this time period, there was a rejection of tetanus toxoid vaccination by pregnant women owing to misconceptions about the vaccine by some religious sects. Mcgil et al<sup>10</sup> in Warri, reported a steady decline from 2000 to 2004 but thereafter, they noticed an increase in incidence from 2005 to 2008. Though the reason for this initial fall followed by a rise in incidence was not stated, it shows that efforts put in place to increase access to health care and immunization services must be sustained otherwise previously achieved gains may be reversed.

Majority (77.3%) of mothers of the patients in the present study had no antenatal care and delivered outside health facilities supervised by untrained health personnel like traditional birth attendants or Christian sisters in the church. This is similar to findings in other centres in Nigeria<sup>9, 10, 13, 14</sup> Turkey<sup>19</sup> and Pakistan.<sup>20</sup> Worthy of note is the fact that 6 (15.0%) actually had antenatal care and delivered in health facilities either supervised by doctors or nurses. These mothers received tetanus toxoid in pregnancy but still ended up having children with NNT. This forces us to question the potency of these vaccines. Perhaps as a result of the irregular power supply in most areas of Nigeria, they may have received ineffective vaccines resulting from poor maintenance of the cold chain required for proper vaccine storage.

The present study shows that a in a significant number of the patients, unhygienic methods were used for both cutting and care of the umbilical cord. The use of unsterile instruments for cutting and tying of the umbilical cord, compounded with improper cord care are probably the likely causes of contamination of the umbilical cords by tetanus spores. The application of toothpaste and metholatum balm on the cord actually provides an anaerobic environment which favours multiplication of tetanus bacteria. Ejike et al<sup>13</sup> in Aba also reported similar use of unhygienic methods (application of Vaseline, engine oil, crude oil and dusting powder) for cord care.

It was interesting to note the methods of “treatment” given to these patients at home before presentation at the hospital which included massage, scarification marks and administration of herbal concoctions. These perceived methods of treatment may actually have caused more harm to the patients as tetanus spasms may have been worsened by massage whereas scarification marks with unsterile instruments may have led to introduction of more tetanus spores to the patients. This shows a high level of ignorance

among the parents, which is not surprising considering that only 4 (10.0%) of the mother’s had secondary education while the rest had either no formal education or primary level of education. Female education is beneficial in empowering women, increasing observation of basic rules of hygiene in cord care and promoting early presentation at the hospital.<sup>3</sup> Also, educated female are also more likely to be vaccinated.<sup>3, 21, 22</sup>

The case fatality rate from the present study was 37.5%. This is similar to the 40.0% reported by Ejike et al<sup>13</sup> in Aba and 35% reported by Tullu et al<sup>2</sup> in India. Emodi et al<sup>11</sup> reported a slightly lower case fatality rate of 31.7% in Enugu. Other authors in Nigeria however reported higher rates of 63.6% and 75.0% in Sagamu<sup>9</sup> and Zaria<sup>14</sup> respectively. The case fatality rate of 37.5% is also lower than 41.8% and 60.4% reported in Turkey<sup>19</sup> and Pakistan<sup>20</sup> respectively. The reason for these differences in case fatality rates is not clear, hence further studies need to be done to examine the relationship between the treatment protocols and patient outcome in the various centres with a view to improving practices for better patient survival. Though slow, case survival rates have improved for NNT over time. Tompkins AB,<sup>12</sup> between April 1953 and August 1956 reported a case fatality rate of 89.6% among NNT cases in University College Hospital Ibadan then Adeoyo hospital. When compared to the 37.5% reported in the present study, about 59 years later, it is clear that there is a remarkable improvement in the case survival rate though more needs to be done.

The case fatality rate was higher for males (46.2%) as compared to females (33.3%) though this difference was not statistically significant. This is similar to findings by Mcgil et al<sup>10</sup> in Warri who reported a case fatality rate of 50.0% in males and 27.6% in females. Onalo et al<sup>14</sup> in Zaria also reported a higher case fatality rate among male patients with NNT. Fetuga et al<sup>9</sup> in sagamu and Dikici et al<sup>19</sup> in Turkey however reported equal case fatality rates among the gender categories.

Most deaths (86.7%) in the present study occurred among patients aged 3 to 7 days at the start of symptoms. This is similar to reports by Tompkins AB<sup>12</sup> and Onalo et al.<sup>14</sup> For NNT, the age at onset of symptoms may be taken as the incubation period since the infection starts soon after birth and is almost always from contamination of the umbilical cord.<sup>23</sup> The shorter the incubation period, the higher the mortality rate.<sup>23</sup> This may be explained by the fact that a short incubation period either depicts increased virulence of

the infecting agent or decreased defense mechanism of the host against the disease.<sup>19</sup> The mortality in the present study was also higher among those with shorter onset interval which is similar to reports from other studies.<sup>1,10,12</sup> This is not surprising as it is a known fact that the shorter the period of onset, the higher the mortality rate.<sup>24</sup>

The present study also showed that mortality rate increased with delay in seeking medical care. This delay in seeking health care may be due to the low educational level of the mothers which is associated with ignorance. Oyedeji GA,<sup>25</sup> reported poor health seeking behavior of people with low educational level.

## CONCLUSION

The present study shows that NNT persists in clinical practice and the predisposing factors do not seem to have changed. There is need for regular monitoring and evaluation of the immunization programmes as well as regular disease surveillance to know the burden of this disease. Early introduction of tetanus vaccination into the school health programme in primary schools will ensure completion of the five doses before child bearing age. As such, pregnant women would require only a single booster dose to fully protect their babies from NNT. Intervention packages should also include behavior change communications with emphasis on promoting health seeking behavior.

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