

## Trends in neonatal and post-neonatal tetanus admissions at a Nigerian teaching hospital

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### Abstract

**Introduction:** Tetanus accounts for high morbidity and case fatality rates in developing countries. This study therefore aimed to identify reasons for the persistence of this disease.

**Methodology:** Paediatric admissions at Ladoke Akintola University Teaching Hospital between 1 January 2006 and 31 December 2008 diagnosed with tetanus were studied. Data was analyzed with SPSS 18 and statistical significance was set at  $p < 0.05$ .

**Results:** Of the total 1,681 paediatric admissions, 30 (1.8%) had tetanus. Of the 878 neonatal admissions, 8 (0.9%) had tetanus, while 22 (2.7%) of the total 803 post-neonatal admissions had tetanus. Neonatal tetanus admissions were significantly higher in 2006 compared to 2007 and 2008 (7 [2.3%] versus 1 [0.2%] [ $\chi^2 = 7.50, P = 0.01$ ]). Of the eight mothers whose neonates had tetanus, seven did not receive tetanus toxoids in pregnancy and five (62.5%) were secondary school dropouts. Post-neonatal tetanus cases admitted in the years 2006, 2007, and 2008 were 4, 12, and 6 children respectively. Most of these 22 children did not receive tetanus toxoid immunization in their first year of life. None of the 22 children received booster doses of tetanus toxoids after their first years of life.

**Conclusion:** Mothers at risk of their babies having tetanus, such as secondary school dropouts, must be identified antenatally and vaccinated with tetanus toxoid. Their babies should also receive good care post-delivery. Completion of routine tetanus toxoid schedule in the first year and booster doses in the post-neonatal age should be ensured.

**Key words:** trends; tetanus; neonatal and post-neonatal

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### Introduction

Tetanus is a vaccine preventable disease and a significant cause of morbidity and mortality in developing countries [1,2,3,4]. The disease is usually classified into neonatal and post-neonatal tetanus in the paediatric age group. A previous study found that neonatal tetanus is a public health problem accounting for 400,000 deaths annually in the developing world [5]. Regardless of programs recommended by the World health organization for its elimination by the year 2000 [6], 124,000 cases and 98,000 deaths attributable to neonatal tetanus were reported between 1998 and 1999 in Africa [1]. Nigeria alone accounts for 40% of this figure in spite of gross under reporting [1]. Thus it is not surprising that neonatal tetanus has been described as the scourge of Nigerian children [7]. Recent studies conducted in Nigeria in the early part of this millennium still show that tetanus has been able to transit across the millenniums retaining its

significance as a cause of mortality in the neonatal age group [1,8].

Post-neonatal tetanus is also a growing problem in Nigeria. It is yet to receive the attention it deserves in most developing countries in comparison with neonatal tetanus in terms of institution of preventive and control interventions. The reason may be due to the fact that most countries in the developing world set the machinery in their health systems to control neonatal tetanus to improve their health indices, thereby relatively neglecting the disease in the older age group.

A review of the literature shows that there are few studies on post-neonatal tetanus in Nigeria and that post-neonatal tetanus is a growing problem [9,10]. Recently, our observations in clinical practice suggest a decline in neonatal tetanus admissions and an increase in post-neonatal tetanus cases. We therefore decided to study the trend, with the aim of documenting this change in trend and discovering the

knowledge gap responsible for the persistence of the scourge of tetanus in the paediatric age groups.

## Methodology

Conducted at the Ladoko Akintola University of Technology Teaching Hospital, Osogbo, Nigeria, the present study was both retrospective and prospective in design. Retrospective analysis of all cases of tetanus in the paediatric age groups between January 2006 and December 2007 was performed using patients' case notes. Also, prospective studies of cases were conducted between January and December 2008. The diagnosis of tetanus was clinical in all cases based on case definition criteria from previous studies [7,9,10,11,12,13].

Ethical approval was obtained from the Ethical Committee of the Ladoko Akintola University of Technology Teaching Hospital. Informed consent was also obtained from the parents of the patients studied. Informed consent was obtained from the patients in the older age group when possible (depending on the severity of disease).

In the cases studied prospectively, information was obtained from the parents. The details obtained include the age and sex of the patient, duration of admission, school and class of the patient, and place of delivery of the neonates. Details of the incubation period and the onset period, complications encountered, and outcome of the disease were also obtained. The incubation period was taken as the interval between the injury and the first symptom assuming that the disease process started from the time of injury, while the period of onset was taken as the interval between the first symptom and the first spasm. Other details obtained were ante-natal clinic attendance and records of tetanus toxoid vaccination during the index pregnancy. Furthermore, details of immunization in the paediatric subjects were sought. Specific enquiries were made as to whether the child obtained the routine combined diphtheria, pertussis and tetanus (DPT) toxoid vaccine as stipulated under the National Program on Immunization in the first year of life and if the subject had obtained any other doses of tetanus immunization.

The details concerning the educational attainments of the mothers were also obtained and classified into three groups for the purpose of this study. Mothers with postsecondary school training, technical college, polytechnic, university education, and higher educational attainments were classified as Group I. The mothers with completed primary school training but uncompleted secondary school training, commercial school certificate, and equivalents were

grouped as class II. All mothers with no formal education or incomplete primary education were grouped as class III.

The Statistical Package for Social Sciences version 18 (SPSS v. 18, IBM, Chicago, USA) was used to analyze the data. The data was also analyzed with the Pearson Chi-square ( $\chi^2$ ) and the results were expressed as descriptive statistics in form of ranges, means, standard deviations, simple percentages and ratios. Yates correction was applied when necessary and P values of  $< 0.05$  were considered significant.

## Results

### *Demography of the paediatric admissions and cases of tetanus*

A total of 1,681 paediatric admissions were studied of whom 803 were post-neonatal patients and 878 were neonates. The 803 post-neonatal admissions consisted of 498 males and 305 females, while the 878 neonatal admissions consisted of 534 males and 344 females. Table 1 shows the total paediatric admissions and the neonatal and post-neonatal tetanus admissions over the study period. The year 2006 had the highest number of neonate admissions with tetanus (7) (n = 305 total admissions, 2.3%), which was significantly greater than the single neonate tetanus admission (n = 573 total admissions, 0.17%) for the combined years of 2007 and 2008 ( $\chi^2 = 7.50$ , P = 0.01, Yate's correction applied). Four (1.3%) of the total 318 post-neonatal admissions in the year 2006 had tetanus, compared with 18 (3.7%) of the total 485 post-neonatal children admitted in the two years 2007 and 2008 ( $\chi^2 = 4.56$ , P = 0.03).

The ages of the neonates with neonatal tetanus ranged from 5 to 11 days and the mean was  $6.9 \pm 2.0$  days. The ages of the post-neonatal cases ranged between 15 months and 15 years and the mean was  $8.5 \pm 4.1$  years. Twelve (54.5%) of the patients were in the age bracket 10 to 15 years, while 5 (22.7%) each were in the age bracket  $> 5$  to 10 years and  $> 1$  month to 5 years. Tetanus was more common in the males compared with the females in both neonatal and post-neonatal tetanus age groups. The age and sex distribution of the neonatal and post-neonatal cases is shown in Table 2.

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**Table 1.** Summary of neonatal and post-neonatal tetanus admissions

Year	Total number of neonates admitted	Number (%) of NNT admissions	Total number of post-neonatal cases admitted	Number (%) of post-NNT admissions	Total paediatric admissions	Total (%) with tetanus
2006	305	7 (2.3%)	318	4 (1.3%)	623	11(1.8%)
2007	309	0 (0%)	250	12 (4.8%)	559	12 (%2.1)
2008	264	1 (0.4%)	235	6 (2.6%)	499	7 (1.4%)
Total	878	8 (0.9%)	803	22 (2.7%)	1681	30 (%1.8)

\*NNT: Neonatal tetanus

**Table 2.** Characteristics of children with neonatal and post neonatal tetanus

Characteristics	Neonatal tetanus n = 8	Percentage in the category	Post-neonatal tetanus n = 22	Percentage in the category
<b>Age groups</b>				
<1 month	8	100.0	0	0.0
1 month – 5 years	0	0.0	5	22.7
5 years – 10 years	0	0.0	5	22.7
10 years – 15 years	0	0.0	12	54.6
<b>Sex</b>				
Male	5	62.5	16	72.7
Female	3	37.5	6	27.3
<b>Incubation period</b>				
5 – 6 days	5	62.5	6	27.3
7 - 8 days	3	37.5	16	72.7
<b>Onset period</b>				
<24 hours	7	87.5	5	22.7
>24 hours	1	12.5	17	77.3
<b>Outcome</b>				
Discharged well	1	12.5	17	77.3
Deaths	7	87.5	4	18.2
*DAMA	0	0.0	1	4.5
<b>Mothers education status</b>				
Group 1	0	0.0	1	4.5
Group 2	6	75.0	7	31.8
Group 3	2	25.0	14	63.6

\*DAMA: Discharge against medical advice

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#### *Education status or class of the post-neonatal tetanus cases*

Of the 22 patients with post-neonatal tetanus 5 (22.7%) were pre-nursery school pupils, 14 (63.6%) were primary school pupils, 2 (9.1%) secondary school students, and the remaining one child (4.5%) was yet to start school.

#### *Incubation period and period of onset*

The children with neonatal tetanus and post-neonatal tetanus had incubation periods ranging from 5 to 8 days, while the period of onset was more than 24 hours in most of the studied children. Details of the incubation period and period of onset are shown in Table 2.

#### *Clinical features at presentation*

All the neonates presented with inability to suck and spasms. Fever, excessive crying, inability to open the mouth and cry well was found in 2 (25%), 2 (25%), 1 (12.5%) and 1 (12.5%) of the neonates respectively. Among the children with post-neonatal tetanus, inability to open the mouth, spasms, backache, neck pain, neck stiffness, rigidity, chest pain, fever,

trismus and abdominal pain were recorded in 13 (72.7%), 13 (72.7%), 7 (31.8%), 5 (22.7%), 5 (22.7%), 4 (18.2%), 3 (13.6%), 2 (9.1%), 2 (9.1%), and 1 (4.5%) of the patients respectively.

#### *Portal of entry and nature of injury*

The most likely portal of entry for tetanus in all the eight neonates studied were the umbilical cord, because the stumps were all found to be moist and septic. Furthermore, the mothers practiced hot fomentation and application of mentholatum as a way of caring for the cord stumps. Injuries to the lower limbs by sharp objects such as nails, broken bottles, thorns and machete cuts occurred in 8 (36.4%) of the 22 post-neonatal total cases and were the most common cause of tetanus among the age group. Injuries to the upper limbs (specifically elbows and fingers) secondary to falls or cuts were found in 3 (13.6%). Ear discharges, leg ulcers, and poorly managed scalp lacerations were found in 6 (27.3%), 2 (9.1%) and 2 (9.1%) cases respectively. Among the cases of ear discharges, two were aged below 5 years. Tetanus was secondary to one (4.5%) poorly circumcised and managed male phallus.

#### *Delivery sites of the neonates and facilities where the primary wounds sustained by post-neonatal tetanus cases were treated*

All of the eight neonates were not delivered in government-owned health facilities. Three (37.5%) were delivered at traditional birth centers and another 3 (37.5%) were delivered at homes. The remaining 2 (25.0%) were delivered at private hospitals. The mode of delivery in all the neonates was by spontaneous vaginal delivery. Of the 22 post-neonatal cases of tetanus, 3 (13.6%) were managed primarily at private clinics and 2 (9.1%) at a local government-owned primary health centre. The remaining 17 (77.3%) did not receive prior treatment at other facilities before presentation. The infant with the infected circumcision wound was circumcised and managed by a traditional birth attendant. None of the facilities administered any form of tetanus toxoid prophylaxis to these patients. The 3 (13.6%) children with ear discharge were managed at home by their parents with topical antibiotics, while 2 (9.1%) children concealed the wound and refused to tell their parents for fear of being reprimanded. The facilities where the wounds were treated were not clearly stated in the remaining 12 (54.5%) children.

### *Days in hospital*

The number of days in hospital for the neonates studied ranged between 1 and 25 days with a mean of 6.25 days. The number was less than 7 days in 7 (87.5%) babies, and these 7 babies died. The remaining baby was in hospital for 25 days before discharge. The hospital days for the post-neonatal group ranged between 2 and 57 days with an average of 23.4 days.

### *Vaccination status of the infants and older children*

Of the 22 children with post-neonatal tetanus, 3 (13.6%) had received the complete doses of tetanus toxoid, while 6 (27.3%) received incomplete doses according to the National Program on Immunization (NPI) schedule. Ten (45.5%) were not vaccinated at all and the vaccination status of 3 (13.6%) children could not be ascertained. None of the 22 children had a booster dose of tetanus toxoid on completing the NPI schedule.

### *Educational status of the mothers*

Six (75.0%) of the mothers of the babies with neonatal tetanus belonged to Class II, and the remaining 2 (25.0%) mothers belonged to class III on the educational scale. None of the mothers was in class I. Five (62.5%) of the 8 mothers of babies with neonatal tetanus were secondary school drop-outs. Among the 22 mothers whose children had post-neonatal tetanus, 14 were in class III, 7 in class II and 1 in class I. Of the total 30 mothers whose children had tetanus, one (3%) was a secondary school graduate, while 13 (44%) had post-primary school education but had not completed secondary school. The remaining 16 (53%) had either an incomplete primary school education or no formal educational.

### *Antenatal care attendance and immunization status of mothers studied*

Of the eight mothers whose babies had neonatal tetanus, seven (87.5%) did not receive ante-natal care and subsequently did not receive tetanus toxoid during pregnancy because of ignorance. The remaining one mother (12.5%) had antenatal care at a private hospital where she received two doses of tetanus toxoids.

### *Complications and outcome*

The only complication observed in the babies with neonatal tetanus was exhaustion. Of the 8 babies studied 7 (87.5%) died from exhaustion and uncontrolled spasms. No complication was observed in the remaining baby. Among the 22 cases of post-

neonatal tetanus 5 (18.2%) developed complications, with septicemia and thrombophlebitis in 2 (9.1%) cases and laryngeal spasm in one (4.5%) child.

Over the three-year period of study, a total of 149 deaths were recorded at the neonatal unit. The seven cases of death from neonatal tetanus accounted for 4.5% of the total mortalities reported in the neonatal ward in the three-year period. A total of 4 (18.2%) deaths were recorded among the 22 children with post-neonatal tetanus. The 4 accounted for 7 percent of the total 57 deaths which occurred among the post-neonatal age group in the three-year period. One (4.5%) out of the 22 patients with post-neonatal tetanus was discharged against medical advice. All the children that died had an onset period of less than 24 hours. All the children with an incubation period of less than seven days in the post-neonatal age group died. Also, all the neonates with an incubation period less than eight days died.

## **Discussion**

The present study recorded a hospital prevalence of 0.9% among the neonates and a marked decline in the number of tetanus admissions over the three-year period of study. A similar low prevalence figure of 0.7% and a declining trend in the incidence of neonatal tetanus was reported in a previous study conducted in the northern part of Nigeria [14]. Possible reasons for the observed decline in the present study include the utilization of routine immunization practices among the pregnant women with tetanus toxoids and aseptic obstetric and post-natal umbilical-cord practices. Previous studies have adduced the same reasons for this decline [13,14]. It is also possible that the low number of cases in the years 2006 and 2007 was due to failure to present at our health facility so cases were not recorded.

Our inability to eliminate neonatal tetanus in Nigeria, on the other hand, may be due to sub-optimal utilization of the vaccines. Asekun-Olarinmoye recently reported that failure to utilize vaccination services against tetanus among some pregnant mothers may be due to inaccessibility, because some mothers do not patronize health facilities during their antenatal period [15]. Other factors include poor obstetric care at delivery through use of non-sterile or hygienic materials to cut the cord stump at birth. Poor cord care practices were common observations in this study, as had been reported in studies done in similar settings and environments [16].

Tetanus vaccine is administered in the three-dose immunization regimen during infancy as the

diphtheria, pertussis, and tetanus combination in the National Program of Immunization (NPI) in Nigeria. It does not confer lifelong immunity against tetanus, as the level of immunity wanes with time. According to the Nigerian NPI schedule, immunization against tetanus is only provided for pregnant women and infants. The children who miss immunization at infancy are susceptible and contribute to the cases of post-neonatal tetanus seen in the present study. Most cases of tetanus occurred in the 5 to 15 years age group in the present study. This is a long interval, even for the children immunized during infancy, and antibody levels may wane if no booster doses are given. Our findings on the age group affected, the gender, the portal of entry, and the outcome in the post-neonatal age group are similar to those obtained in previous studies [9,10,11]. The male sex reported more injuries especially to the lower limbs.

The present study shows that some of the cases of post-neonatal tetanus were managed initially at some health facilities. The private hospitals and primary health centers did not administer any form of tetanus prophylaxis to the children. All first contact health service providers should note that adverse consequences may follow a failure to adhere to the basic guidelines for the management of wounds and ensure prompt and proper management of wounds following injuries [17]. Vigilance is necessary because a number of children conceal wounds sustained from injuries because of the fear of being reprimanded as was the case in 9.1% of the children studied. This observation underscores the adoption of regular effective routine vaccinations against tetanus as the main strategy for disease prevention. Also, infections following suppurative ear disease or burns should be properly and promptly managed because tetanus can occur secondary to them [18,19].

The fatalities reported (87.5%) for neonatal tetanus might have been prevented with appropriate care, although the 18.2% obtained for post-neonatal tetanus is comparable with those of other studies [3,4,9,10,11]. The poor outcome among the present studied children with a short incubation and onset period is consistent with that of other previous studies [2,3,10,11].

## Conclusion

In conclusion, tetanus remains an important cause of morbidity and mortality at our teaching hospital among the neonates and post-neonatal age group, although a significant decline in morbidity was recorded among the neonatal age group. To sustain the decline in rates of infection among the neonates, the

health ministry should appraise the care and services rendered outside the government hospital setting, with the aim of improving good ante-natal and obstetric services. Potential mothers of neonatal tetanus patients, such as secondary school drop-outs, should be identified. They should receive good care antenatally and at delivery. Their babies should receive good care at delivery and in the post-natal period. The National Program on Immunization should be expanded to include school-age children. Two booster doses of tetanus toxoids at primary and secondary school entry should be administered according to previous recommendations [11,20]. In addition, schoolchildren and their parents must be educated about tetanus and wound management. These recommendations could reduce the post-neonatal tetanus burden to its barest minimum and ultimately, the elimination of tetanus.

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