

## A 6-year review of Post-Neonatal Tetanus at Usmanu Danfodiyo University Teaching Hospital, Sokoto.

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### ABSTRACT

**Background:** Tetanus is a vaccine-preventable disease but its incidence has remained unacceptably high in developing countries. **Objective:** To determine the prevalence, risk factors and outcome of post-neonatal tetanus at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto. **Methods:** A retrospective descriptive study from 1<sup>st</sup> January 2010 to 31<sup>st</sup> December 2015. Children aged 1 month to 15 years diagnosed with post-neonatal tetanus were studied. Information from the admission files was extracted. Data was analysed using SPSS version 20. **Results:** Total admissions during the study period were 14,458; 61 had post-neonatal tetanus, giving a prevalence of 0.4%. The M: F ratio was 1.5:1. The mean age was 7.4±3.2 years. Fifty-nine (96.7%) were not immunised against tetanus. Portal of entry for the organism was trauma injuries to the foot in 33(54.1%). Thirty-one (50.8%) were discharged, 5(8.2%) DAMA, while 25(41.0%) died, and case fatality was 41.0%.

**Conclusion:** Post-neonatal tetanus is a major cause of morbidity and mortality in Sokoto. There is need for improved health education, sustainability of immunisation programmes and coverage to eradicate this scourge.

**Key words:** Post-neonatal tetanus, Sokoto.

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### Introduction

Tetanus is an acute, often fatal disease caused by an exotoxin produced by the bacterium *Clostridium tetani*.<sup>1</sup> It is a vaccine preventable disease and a public health problem worldwide, particularly in the developing countries including Nigeria.<sup>2</sup> Although there is widespread availability of effective vaccine against the disease in the past four decades, the disease still remains a major cause of morbidity and mortality among children in Nigeria and other developing countries of the world.<sup>3</sup> The incidence of post neonatal tetanus has remained unacceptably high in developing countries.<sup>2,4</sup> The reasons attributed to the high burden of the disease in Nigeria and other developing countries include low immunisation coverage, lack of sustainability of immunisation programmes

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and deficient booster doses of tetanus toxoid at appropriate period to eligible children.<sup>2</sup> Hospital-based studies in Nigeria showed increasing incidence of tetanus infection.<sup>2,4,5</sup> Mortality from post-neonatal tetanus remained high among children in Nigeria and other developing countries.<sup>2,5,6</sup> Post neonatal tetanus was reported to account for 27.2% of childhood deaths among hospitalised children in Nigeria.<sup>7</sup> Vaccination coverage rate using Diphtheria, Pertussis, Tetanus (DPT3) is 38.0% in Nigeria, with widespread disparities between rural and urban communities.<sup>8</sup> A 95% immunisation coverage is necessary for the sustained control of vaccine-preventable diseases.<sup>4</sup> The non-attainment of 95% immunisation coverage rate as well as not giving booster doses of tetanus toxoid as part of routine childhood immunisation is responsible for the high burden of the disease in Nigeria.<sup>9</sup> However, in most developed countries with well-established immunisation policies and coverage, morbidity and mortality due to tetanus are low. A review of post neonatal tetanus in the United State with an immunisation coverage among infants and children with at least three doses of Diphtheria Tetanus and Pertussis vaccine and tetanus toxoids of 94.0% or higher, from 1992 through 2000 found that 11 of the 13 non-neonatal cases occurred in children who were unvaccinated because of religious or philosophic objections.<sup>1</sup> Review of literature revealed very scanty data on this subject in the North-Western region of Nigeria. It is therefore necessary to carry out this study, which aimed to determine the prevalence, risk factors and outcome of post-neonatal tetanus at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, with a view to providing possible suggestions towards elimination of the disease.

## Materials and Methods

The study was a 6-year retrospective hospital-based study carried out at the Emergency Paediatric Unit of UDUTH, Sokoto. The hospital is a tertiary health facility located in Sokoto, the Sokoto state capital, North - Western Nigeria. It serves as a referral centre for public and private hospitals in Sokoto, Zamfara, Niger, Katsina and Kebbi states of Nigeria and the neighbouring Niger and Benin Republics in the West African sub-region. Records of children aged 1 month to 15 years admitted at the Emergency Paediatric Unit of the hospital, with clinical diagnosis of post-neonatal tetanus (PNT) were reviewed from 1<sup>st</sup> January 2010 to 31<sup>st</sup> December 2015.

The age, gender, presenting complaint, immunisation status, portal of entry, socio-economic class (SEC), place of domicile, duration of hospitalisation, complications, duration of admission and outcome of the subjects were extracted from patients' folder. Socio-economic index scores were awarded to the occupations and educational attainments of each parent or caregivers using Oyedeji's socio-economic classification scheme.<sup>10</sup> The mean of four scores (two for the father and two for the mother) approximated to the nearest whole number was the social class assigned to each child.<sup>10</sup>

Socio-economic classes I and II are the upper socio-economic class, class III is the middle class, while socio-economic classes IV and V form the lower socio-economic class.<sup>10</sup> Inclusion criteria were; age 1 month to 15 years and a clinical diagnosis of post-neonatal tetanus.

Immunisation status was determined using the current National Programme on Immunisation (NPI) schedule. A child is said to be fully immunised against tetanus if he or she had received all of the three doses of DPT.



Patients were managed with the use of drug combination therapy comprising of phenobarbitone, chlorpromazine and diazepam given parenterally until spasms were fully controlled before changing to oral via nasogastric tube. Breakthrough spasms, defined as spasms occurring after initial control of spasms, were treated with diazepam. All patients had Anti-tetanus serum to neutralize the circulating toxins, antibiotics such as crystalline penicillin or metronidazole were given to eradicate organisms.

Those with severe spasms had intravenous fluids until spasms were under control after which pap and milk were given by nasogastric tube, until patients could tolerate orally. Tetanus toxoid (TT) was also given to all patients for active vaccination before discharge.

Data analysis was done using Statistical Package for Social Sciences (SPSS) version 20.0.

#### *Ethical clearance*

Ethical clearance for the study was obtained from the Research and Ethics Committee of the UDUTH, Sokoto.

#### **Results**

Total admission during the study period was 14,458 of which 61 had post-neonatal tetanus, this represented 0.4% of the total admission in our children emergency room during the period under review.

Year 2010 had the highest number of post-neonatal tetanus cases, of which 17 out of 61 children were affected. There was a downward trend in the incidence of post-neonatal tetanus with only 4 children presenting in 2015 as depicted in figure 1.

Thirty-seven (60.7%) of the subjects were males while 24(39.3%) were females with a M: F ratio of 1.5:1. Their ages ranged from 2-15years with

a mean age of  $7.4 \pm 3.2$  years. Forty-nine (80.3%) of the children were aged 5years and above as shown in table 1.

The socio-economic class (SEC) of the children is as shown in table 1, with 37(60.7%) and 24(29.3%) in the lower and middle SEC, none in the upper SEC. Majority of the children 36(59.0%) were from the rural areas while the remaining 25(41.0%) were from the urban areas.

Fifty-nine (96.7%) of the children were not immunised against tetanus, only 2(3.3%) were immunised as shown in figure 2 and none of the children received booster doses of TT.

Lower limb injury was the predominant portal of entry in 34(54.1%), it was unknown in 14(23.0%), while following Chronic Suppurative Otitis Media it was 10(16.4%). Other less frequent portals of entry for the organism in this study were injury to the scalp in 3(4.9%) and congenital discharging sinus in 1 patient (1.6%).

There was no available data for incubation period and period of onset in 37(60.7%) and 32(52.5%) respectively, as shown in table 2.

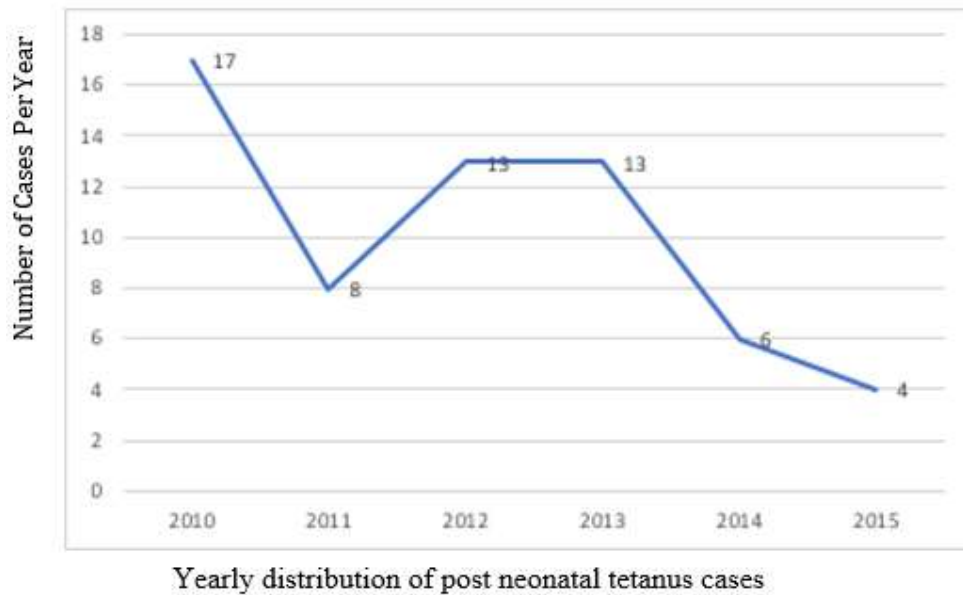
All the patients presented with generalised spasm, abdominal rigidity was seen in 57(93.4%) of patients, trismus and opisthotonus were observed in 47(77.0%) and 21(34.4%) of affected children respectively, Fever was seen in 18(29.0%) and risus sardonicus observed in 8(13.0%) were the less common mode of presentation as shown in table 2. Some patients presented with more than one feature.

Thirty-one (50.8%) of the patients spent less than 10 days on admission while 8(13.1%) spent more than one month on admission as shown in table 3.

Their mean duration of hospital stay was  $14.7 \pm 11.8$  days (range 1 - 41days). Figure 3 shows the outcome of patients with post neon-



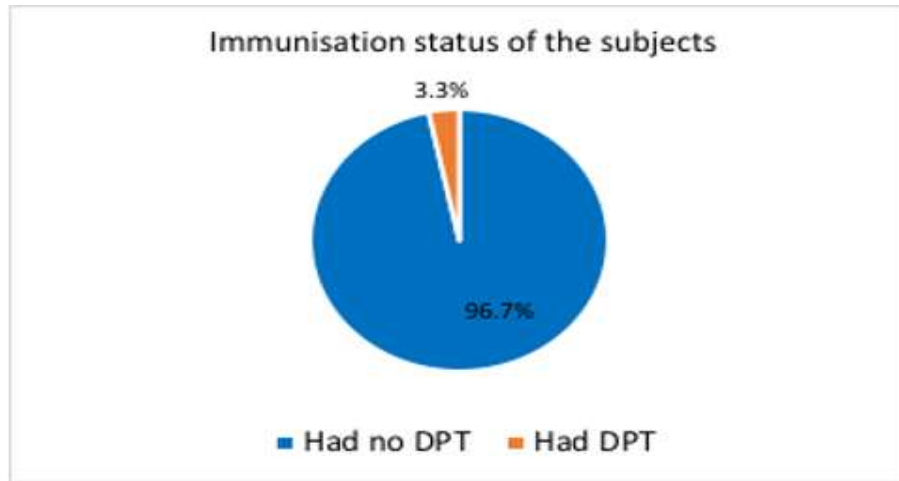
-atal tetanus in our study. The case fatality rate was 41.0%. Majority of the studied subjects 48(78.7%) had no complication documented in their folders, however, 11(18.0) had aspiration pneumonia and 2(3.3%) had acute renal failure.



**Figure 1:** Line chart showing the yearly distribution of post neonatal tetanus admissions

**Table 1:** Socio-demographic characteristics of tetanus patients and place of domicile

Parameter	Number	Percentage
<b>Age in years</b>		
<5	12.0	19.7
5 - <10	30.0	49.2
10 - 15	19.0	31.1
<b>Social Class</b>		
Upper	0.0	0.0
Middle	24.0	39.3
Lower	37.0	60.7
<b>Place of domicile</b>		
Urban	25.0	41.0
Rural	36.0	59.0

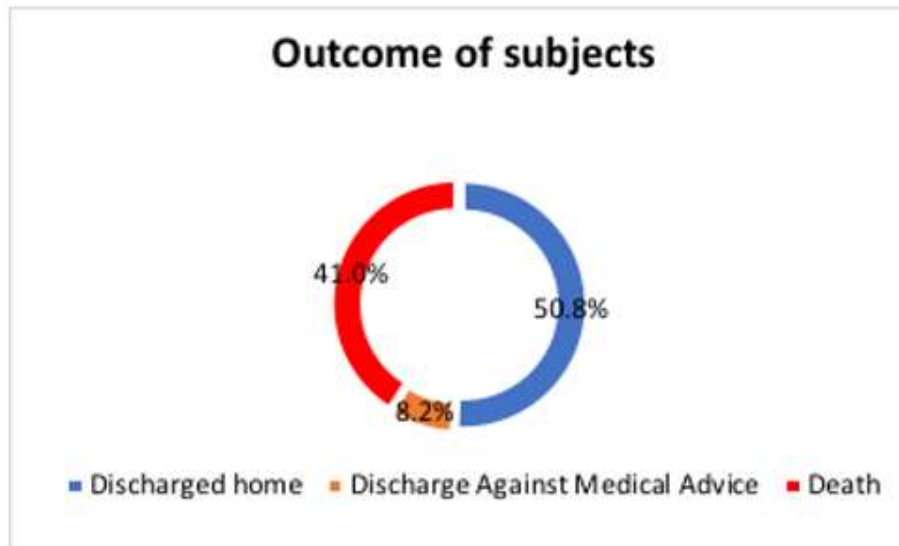


**Table 2:** Incubation period and Presenting features in subjects

Variables	Number	Percentage
<b>Incubation period (days)</b>		
<7	6.0	9.8
7 - <14	6.0	9.8
≥14	12.0	19.7
Unknown	37	60.7
<b>Period onset (days)</b>		
<3	19.0	31.1
3 - <7	8.0	13.1
≥7	2.0	3.3
Unknown	32.0	52.5
<b>Presenting features</b>		
Generalised Spasms	61.0	100.0
Abdominal rigidity	57.0	93.4
Trismus	47.0	77.0
Opisthotonus	21.0	34.4
Fever	18.0	29.5
Risus sardonicus	8.0	13.1

**Table 3:** Duration of hospitalisation

Duration of Admission (days)	Number	Percentage
<10	31.0	50.8
10 - <20	6.0	9.8
20 - <30	16.0	26.2
≥30	8.0	13.1
<b>Total</b>	<b>61</b>	<b>100.0</b>



**Figure 3:** Outcome of subjects

### Discussion

The study aimed to determine the prevalence, risk factors and outcome of post-neonatal tetanus at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto.

In this study 0.4% of the total number of children admitted during the study period had post neonatal tetanus. This is lower than 0.6% a finding by Adeola *et al*,<sup>4</sup> 1.4% and 1.1% reported by Alhaji *et al*<sup>2</sup> and Anah *et al*<sup>5</sup> respectively, but higher than 0.07% reported by Chukwuka *et al*<sup>6</sup>. This may be due to studying both neonatal and post-neonatal tetanus at the same time in some of these studies and excluding large number of subjects with incomplete data. Even though, the prevalence in this study is lower than what was reported by some studies<sup>2,4,5</sup> it is still not acceptable because tetanus is a vaccine preventable disease that is rare in countries with established immunisation policies.

In this study, a higher proportion of the children with post-neonatal tetanus were from the rural areas. This is similar to the findings reported from other studies.<sup>2,6</sup> This

may be attributable lower immunisation coverage, ignorance and poverty in the rural areas. Most children with post neonatal tetanus from this study were from lower SEC which is in consonance with other reports in Nigeria.<sup>2,4,11</sup>

Male children were predominantly affected than females, this in keeping with findings of many authors in Nigeria.<sup>2,4</sup> This may be due to adventurous nature of boys and tendency to walk barefoot which put them at risk of developing lower limb injury and tetanus.<sup>4</sup>

Majority of the cases with post neonatal tetanus in our study were recorded among children aged 5years and above, which is consistent with the findings of other researchers in Nigeria.<sup>4,11-12</sup> This may be due to lack of booster doses of tetanus toxoid given to these children. In many developing countries children are given only three doses of tetanus vaccine in infancy as part of the national programme of immunisation. None of the children in this study had booster doses of tetanus, similar to findings from Maiduguri,<sup>2</sup> Lagos<sup>4</sup> and Ibadan.<sup>9</sup>

The mean age of 7.4±3.2 years reported in this study is closer to 6.5±3.2 reported by Adeola *et al*,<sup>4</sup> 8.4 reported by Familusi *et al*<sup>9</sup> in Ibadan and 6.9±3.87 years documented by Alhaji *et al*<sup>2</sup> among children in the Northern part of Nigeria but lower than 9.8±4 reported by Yaguo<sup>11</sup> and 9.8±4.5 years By Chukwuka *et al*<sup>6</sup> but higher than 5.83±3.4 years reported by Akunhwa *et al*<sup>13</sup>. In all the reports most of the subjects were in the school age which suggests that the current programme on immunisation confers immunity to the child up to age of five years, this further emphasises the need to include booster doses of tetanus toxoid for all children as part of the National programme on Immunisation.

Majority of the children except two (3.3%) were not immunised against tetanus similar findings were reported by previous studies<sup>2,5,6,9,11,12,14</sup> Sadly, immunisation coverage in the North-Western region of Nigeria is just 10.0%<sup>8</sup> and only 2.6% of children in Sokoto received DPT3.<sup>8</sup> This may be attributable to various socioeconomic and cultural factors that leads to missed immunisations. Two patients who were fully immunised against tetanus during infancy but still developed tetanus. Other researchers<sup>2,5,8,12</sup> had also observed similar findings. This may probably be due to either waning of protective antibodies, lack of booster doses of tetanus toxoid, problems with the cold chain and probably poor injection technique.

Most of the children in this study were from the rural area, similar to findings reported in the past.<sup>6,14</sup> Possibilities are that children from the rural areas are likely to walk barefoot which predisposes them to injuries, also lack of awareness about tetanus by the caregivers is another major challenge, as well as lack of access and poor health facilities could also explain the reason why tetanus is more

prevalent in the rural areas.<sup>6</sup> Lower educational levels of parents have also been implicated.<sup>6,15</sup>

Lower limb injury was the commonest portal of entry in our subjects. Similar findings were reported by other authors,<sup>2,5-6</sup> followed by Chronic Suppurative Otitis Media.<sup>2,6</sup> Possible explanations for the lower limbs to be the predominant portal of entry in this study could be due to explorative nature of male children which exposes them to injuries and thereby predisposing them to tetanus infection as majority of the affected children were males. The incubation period of most of the patients was not known because parents and caregivers of those subjects could not ascertain the time of the injuries or infection that served as portal of entry. Mean duration of hospital stay of 14.7±11.8 days (ranging from 1 - 41days) is comparable to the report from other hospitals in Nigeria.<sup>2,4-5</sup> Prolonged hospitalisation increases the cost of medical care and can lead to caregiver burn out. Nine out of the 61 patients with post-neonatal tetanus discharge against medical advice, similar findings were reported by Alhaji *et al*<sup>2</sup> and Yaguo *et al*.<sup>7</sup> This is not surprising as majority of the caregivers were from lower socio-economic class, superstitious belief may also be another reason for caregivers discharge against medical advice due to attributing disease manifestation to evil forces that can only be cured by spiritual powers and preference for cheaper alternative method of treatment.<sup>16</sup>

Generalised spasms was the commonest presenting complaint in this study which is in agreement with findings of various researchers,<sup>2,4,11</sup> and the less common presenting complaints were fever and risus sardonicus.<sup>4,6</sup> The case fatality rate of 41.0% reported in this study is lower than 62.1% reported by Adegboye *et al*,<sup>17</sup> but higher than



18.0% and 4.1% reported by Alhaji *et al*<sup>2</sup> and Adeola *et al*,<sup>4</sup> this may be explained by shorter duration of study and smaller number of subjects in their study unlike in our study. Most of the parents of the subjects in Adeola *et al*<sup>4</sup> study were from urban area and were of higher socio-economic status compared to the parents of our subjects, these might have made their subjects to have presented earlier to the hospital before complications set in. Also, majority of the parents of our studied subjects being of lower socio-economic class, might have attributed the disease manifestation to evil spirits leading to delay in presentation to the hospital when complications had already set in. Most of the mortalities occurred few days on admission, this compares favourably with the findings of Alhaji *et al*<sup>2</sup> and Cook *et al*;<sup>18</sup> earlier reports<sup>18</sup> have shown that mortality due to tetanus occurs soon after admission from acute complications such as airway obstruction among others. Some of the limitations of this study were incomplete documentation of period of onset, incubation period, complications, most of the patients and caregivers could not remember the portal of entry and lack of follow-up of patients who signed against medical advice.

### Conclusion

The prevalence and mortality from post neonatal tetanus reported in this study are unacceptably high, despite numerous programmes in the country to prevent tetanus. There is a declining trend in hospitalisation due to post-neonatal tetanus in our health facility, reducing yearly.

Majority of the children in this study had no routine childhood immunisation, therefore, there is need to improve immunisation coverage especially in the rural areas, as well as health education to eradicate this scourge.

Utilisation of the school health programme to ensure adequate immunisation coverage, including mandatory tetanus toxoid and booster doses in primary and secondary schools all over the country is advocated. Booster doses of tetanus toxoid should be added to the National programme of immunisation schedule.

The populace should be enlightened on the need to seek prompt hospital treatment of trauma, puncture injuries and otitis media.

### Competing Interests

The authors declare no competing interests.

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### Authors' Contributions

All the authors have read and agreed to the final version of this manuscript and have equally contributed to its content and to the management of the cases.

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