

## CLINICAL PROFILE AND OUTCOME OF TETANUS NEONATORUM: A PRELIMINARY REPORT

NANCY NAZAIRE-BERMAL, MD\* , LULU C. BRAVO, MD\*

### ABSTRACT

Tetanus neonatorum is still an important cause of morbidity and mortality in developing countries. Thirty six cases of neonatal tetanus admitted in 2 tertiary hospital in Metro Manila from January 1992-July 1998 were reviewed. Patients were divided into two groups, first consisted of those who survived and the second were those patients who died. There was male predominance for both groups 65% and 60% respectively. Age on admission is significantly correlated to mortality. Patient less than 5 days old tend to have poorer prognosis. Other factors known to affect prognosis such as duration of symptom, place of delivery, attendant at birth and maternal tetanus immunization seem not to correlate with prognosis. Mortality rate of 27.8% is relatively lower compared to other series. Out of the 26 patients who recovered from neonatal tetanus, 5 patients were screened for any neurodevelopmental sequelae. One patient had abnormal flash stimulation on VER, one had peripheral and suspicious conduction defect in the braistem auditory pathway as seen in BAER. Another patient presented with expressive/receptive speech delay. In the absence of other causes of brain damage, the deficits in these children can be attributed to neonatal tetanus. This study still emphasize the need for primary prevention in eliminating neonatal tetanus and its subsequent sequelae.

### INTRODUCTION

Tetanus neonatorum is an acute neurologic disease caused by an infection of *Clostridium tetani* usually having its onset during the first 28 days of life. The typical setting is an unimmunized mother who delivered outside the sterile environment of the hospital, attended by a traditional birth attendant or midwife who did not use sterile techniques in cord cutting and cord care. It usually manifest within 3-12 days of life as progressive difficulty in feeding due to inability to open the mouth. Irritability and poor feeding are the earliest clinical manifestations followed by trismus, rigidity, opisthotonus and hypertonicity.

It is still an important cause of morbidity and mortality in developing countries accounting for 23 to 73% of neonatal deaths (15). In 1993, the World Health Organization defined it's goal as the elimination of neonatal tetanus as a public health problem by reducing its incidence to less than one case per 1,000 live births

for all health districts<sup>7</sup>. In the Philippines, data from the Field Epidemiology Training Program of the Department of Health showed a case fatality rate of 33.3% in 1996.

To achieved and maintain tetanus elimination, 80% or more of infants need to be protected at birth through vaccination of their mothers with at least two doses of tetanus toxoid or through clean delivery and cord care practices<sup>7</sup>. Our national data states that 10.6% of mothers of reported cases of neonatal tetanus were unimmunized. In a review by Castor<sup>5</sup> of immunization status of mothers of tetanus neonatorum cases admitted in PGH only 4.55% of the mothers had received tetanus immunization during pregnancy. Complete prenatal immunization with tetanus toxoid during pregnancy with two doses 1 month apart was associated with 88% reduction in the risk of neonatal tetanus among the newborn children.<sup>8</sup>

Other risk factors identified in the development of tetanus neonatorum are place of delivery and attendant at birth and instruments used in cutting the umbilical cord<sup>4,6</sup>. Taha reported a mortality rate of 62 per 1000 if no or traditional cord cleaning was used<sup>12</sup>. In India, tetanus neonatorum was reduced by training of health attendants, increasing the tetanus neonatorum to pregnant women and distribution of presterilized delivery kits to pregnant women for use by birth attendants<sup>10</sup>.

Mortality from tetanus neonatorum remains to be high ranging from 40-60%. Poor prognosis is associated with age on admission <10 days, symptoms <5 days and presence of risus sardonicus and fever<sup>9</sup>. A study done on the causes of death in tetanus neonatorum showed that hypothermia and bronchopneumonia were the commonest events leading to death<sup>11</sup>. Antia-Obong found in their series that 33% of infants with tetanus were also bacteremic most commonly from an infected umbilical cord stump<sup>2</sup>.

Aside from eliminating neonatal tetanus, prevention of sequelae among those who recovered must be look into. Among those who survived, mental retardation is common<sup>3</sup>. A study done in 1994 on the evaluation of late sequelae of tetanus infection revealed that 5 of the 28 patients who survived had mild mental

\* Philippine General Hospital

retardation. Their electroencephalograms (EEG) were normal except for one case who had epileptic focus. Their visual and likewise the brainstem-evoked potentials were measured and they were in normal ranges<sup>4</sup>.

This study was undertaken to review tetanus neonatorum cases specially factors affecting prognosis and to evaluate the neurodevelopmental status of patients who survived from this preventable disease.

### MATERIAL AND METHODS

This is a retrospective review of tetanus neonatorum cases admitted at two tertiary Hospital namely: Philippine General Hospital (PGH) and Research Institute for Tropical Medicine (RITM) from the period of January 1992-July 1998. A total of 62 cases with a final diagnosis of tetanus neonatorum were recorded. A data collection form was accomplished. Possible factors that are known to affect prognosis such as age of onset of symptoms, interval between first symptom and spasms were identified. Other factors like prenatal care, maternal antenatal immunization, place of delivery, attendant at birth and instruments used in cutting the cord were also considered. Patients were divided into 2 groups, the first group consisted of patients who survived and the second group composed of patients who expired. Data were entered using the EPI info software. Clinical data were compared in both groups. Student's t-test was used for comparison of the means of continuous variables unmatched data and chi square for multiple matched data.

Patients who recovered from the infection were recalled through mails. Electroencephalogram (EEG), Visual evoked response (VER) and Brainstem auditory evoked response (BAER) were taken. A developmental assessment using the Denver developmental screening test was likewise done.

### RESULTS

From the 62 recorded cases of neonatal tetanus, only 39 charts were retrieved. Of the 39 cases two were excluded and these were both Emergency Room mortalities more compatible with sepsis rather than tetanus since the history did not reveal any episodes of trismus nor spasms. Another patient was also excluded because of lack of vital information in the birth and maternal history. A total of 36 records were included in the analysis.

**Table 1. Clinical data of neonatal tetanus cases**

	Survivors		Death		P value
	Mean+/- SD	Range	Mean+/- SD	Range	
Age (days)	8.5+/-3.65	5-19	5.6+/-3.65	1-8	.038
Birth wt. (kg)	3.19+/-0.36	2.3-3.9	2.9+/-0.72	1.7-3.1	.105
Male/Female	17/9		6/4		.527
Age at onset of symptom (days)					.09
1-4	2		4		
4-8	17		5		
9-12	4		0		
>12	3		1		
Duration of symptom (days)					0.19
1	18		9		
2	4		0		
3	3		0		
4	1		0		
5	0		1		

The first group, survivors consisted of 17 (65%) males and 9 (34%) females whose ages ranged from 5-19 days and mean weight on admission of 3.29 kg. The second group consisted of 6 males (60%) and 4 females (40%) with age range of 1-8 days and mean weight of 2.9 kg. Sex and weight on admission does not seem to have a correlation on prognosis. However, the age on admission was found to have statistical significance i.e., younger patients tend to have poorer prognosis. Mean age at onset of symptoms was not determined since grouping of age of onset was done as seen in Table 1. Majority 73% for the survivors and 90% for those who expired had the onset of infection during the first week of life. Although there was no statistical significance both groups had one day duration of symptom before admission.

**Table 2. Signs and symptoms of patients with neonatal tetanus**

	Survivors		Death		P value
	Yes	(%)	Yes	(%)	
Poor suck	23	(88)	9	(90)	.69
Fever	11	(42)	6	(60)	.29
Trismus	19	(73)	6	(60)	.35
Irritability	3	(12)	3	(30)	.19
Convulsion	3	(12)	4	(40)	.07
Cyanosis	12	(46)	4	(40)	.51
Incessant crying	6	(23)	0		.11
Poor activity	1	(3)	2	(20)	.18
Umbilical discharge	3	(12)	2	(20)	.42
Spasm	12	(46)	2	(20)	.14
Vomiting	0		1	(10)	.27
Difficulty of breathing	0		2	(20)	.07
Jaundice	2	(8)	1	(10)	.63
Abdominal enlargement	1	(3)	0		.72

Table 2 shows the summary of signs and symptoms of neonatal tetanus. Poor suck was the most common presenting symptom for both groups followed by trismus, cyanosis and fever. Although not statistically significant, convulsion and difficulty of breathing tend to correlate with poorer prognosis. Fever was likewise noted in 60% of deaths and only 42% of survivors.

**Table 3. Place of delivery**

	Survivors	Death	Total
Home	18	8	26 (72%)
Hospital	5	2	7 (19%)
Lying-in	3	0	3 (8%)

Table 3, 4 and 5 shows that majority (72%) of cases were delivered at home attended by traditional health attendant with 55% had prenatal check-ups and 52% of the mothers did not received any tetanus toxoid immunization.

**Table 4. Attendant at birth**

	Survivors	Death	Total
Doctor	6	1	7
Midwife	9	4	13
Traditional birth attendant	10	4	14
Others (grandmother)	1	1	2

**Table 5. Prenatal care**

	Survivors	Death	Total
Yes	14	2	16
No	12	8	20

**Table 6. Maternal antenatal immunization**

	Survivors	Death	Total
Yes	5	2	8
No	13	6	19

**Table 7. Instruments in cutting the cord**

	Survivors	Death	Total
Scissors	11	7	18
Sterile instruments	8	2	10
Blade	3	1	4
Bamboo stick	2	0	2
Gas lamp	1	0	1
Not stated	1	0	1

Majority of the cases had their cords cut with scissors which was either boiled or cleaned with alcohol. Attendants of patients delivered in the hospital and lying-in clinic had used sterile instruments in cord cutting. Other unhygienic means of cutting the cord like the use of blade, bamboo stick or passing thru an alcohol lamp were still employed by traditional birth attendants. Although when tested statistically, there was no significant correlation between the manner of cord cutting and survival rate.

**Table 8. Complications**

	Survivors	Death
Pneumonia	13	4
Sepsis	1	6
Omphalitis	1	0
None	11	0

Table 8 shows the complications seen among neonatal tetanus cases. For patients who recovered, 57% had nosocomial pneumonia, omphalitis and sepsis. Eleven out of 26 patients in the first group did not have any associated morbidity. Among those patients who expired, sepsis was found in 60% of cases and was also the probable cause of death.

The average length of stay for the first group was 29.6 days with a range of 8-57 days. The second group had a shorter duration of hospital stay with mean of 5 and range of 1-17 days.

**Table 9. Neurodevelopmental profile of patients who recovered from neonatal tetanus.**

Patients	Sex	Age	DDST	EEG	BAER	VER
MO	M	1 4/12	N	N	abnormal	pending
RC	M	6 7/12	abnormal	N	N	N
JB	M	4 4/12	N	N	N	abnormal
RR	F	4 8/12	N	N	N	pending
JC	M	2 9/12	N	N	N	pending

Table 9 shows the neurodevelopmental profile of 5 out of 26 patients who survived from tetanus neonatorum. The electroencephalogram of all patients were within normal. The abnormal BAER of MO showed mild peripheral hearing defect on the right ear which improved with increasing stimulus intensity. However there was a suspicion of conduction defect in the brainstem auditory pathway between the pons and midbrain bilaterally.

Because of problems in the machine only 2 patient had underwent visual evoked response. One patient showed abnormal flash stimulation with prolonged P100 latencies bilaterally.

The oldest of the 5 patients RC had expressive/receptive language delay on Denver Developmental Screening Test.

## DISCUSSION

Despite the availability of immunization and the efforts of the World Health Organization in eliminating this preventable disease, mortality is still high and has varied from 55% to 98.8% in different series. In our study, fatality rate is 27.8% which is below compared to studies done in Batangas, Cagayan and Cebu<sup>1,3,5</sup> which reported fatality rates of 52%, 67.5% and 59% respectively. This could be attributed to adequate facilities especially ventilatory support and health personnels in the two tertiary hospitals where these patients were admitted.

It was generally accepted that males are more affected by tetanus compared to females as noted in our study. However, sex was not a risk factor in determining outcome. Weight on admission which could approximated the birth weight since most of our patients were within the first week of life at the time of onset of infection had no significant effect on prognosis. In this study only the age was found to have an influence on outcome. Patients less than 5 days old tend to have poorer prognosis because this would imply a faster incubation period. At this point, other factors related to the birth and instruments used in cutting the cord did not seem to correlate to prognosis. Despite the urban setting of this study 69% were delivered at home with 14 out of 36 being delivered by traditional health attendant. The 7 cases born in the hospital should also be noted. Although 5 out of 7 survived, hospital delivery does not guarantee protection to neonatal tetanus, thus prevention has to be emphasized in the form of tetanus toxoid immunization and proper cord care techniques.

Associated morbidities noted in our patients like pneumonia and sepsis were also seen in other series. Antia-Abong in 1992 reported 33% incidence of sepsis among patients with neonatal tetanus with coliforms and *Staphylococcus aureus* as the predominant isolates. Pneumonia was found to be the most common cause of death in a series by Salimpour. The increased in occurrence of pneumonia in this disease may be ventilator associated since most of them required ventilatory support during the control of spasms.

It is generally believed that tetanus does not leave any neurological sequelae. However, the generalized convulsive spasms associated with cyanosis and apnea and consequently brain hypoxia may cause long term deficits for those surviving the infection.

**Table 10. The sequelae of patients who recovered from neonatal tetanus**

	Growth Failure	Micro cephal	Neurological findings	Mental retardation	Abnormal EEG	BAER	VER
Teknetzi et al (n=38,1975)	1						
Antar et al (n=24,1989)	10		3(brisk DTR Incoordination)	7			
Tutuncuoglu (n=6,1993)				3		1	
present study (n=5, 1998)			DDST: speech delay			1	1

Summary of previous studies on sequelae of neonatal tetanus is presented in Table 10. EEG abnormalities such as increased amounts of the activity, focal slow wave and occipetal focus were observed at a rate of 26-60%. The high incidence of mental retardation of 10% is higher than the incidence of 3% in children. Other deficits noted were brisk deep tendon reflexes and incoordination. Our study is the first to report abnormalities in BAER and VER. In the absence of other causes of brain damage, the deficits in these children can be attributed to the neonatal illness.

## CONCLUSION

This preliminary study which included 36 patients with of tetanus neonatorum, does not seem to correlate previously known factors to affect prognosis such as duration of symptom, place of delivery, attendant at birth and antenatal immunization except for the age of onset that was the earlier the onset the poorer the prognosis. The findings of neurodevelopmental abnormalities in the 3 out of 5 patients who were recalled, emphasize the need for primary prevention instead of focusing on the rehabilitation of its consequences.

## RECOMMENDATION

1. Since this a retrospective study, chart retrieval is a major problem not to mention information is usually not complete thus a prospective longitudinal study is recommended.

2. Other tertiary hospitals in Metro Manila can be included to be able to come up with a significant sample size.
3. Complete physical and neurological examination can be done for comprehensive neurodevelopmental assessment.

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