

CASE REPORT

Neonatal Tetanus: A Study of Five Cases in Sandakan, Sabah

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SUMMARY

This study aims to study the demographics, clinical presentation, treatment and outcome of neonatal tetanus patients managed at Hospital Duchess of Kent from January 1st 2006 to December 31st 2006. Five neonates were studied. All presented with fever, poor sucking and limb stiffness, with a history of unsterile delivery and uncertain maternal tetanus immunity status. All were nursed in a minimal-stimuli environment and were given IV penicillin G, IM tetanus immunoglobulin and sedatives to control spasms. Nutrition and chest physiotherapy were rendered. Three patients required artificial ventilation. Duration of treatment ranged from 25 to 44 days. All survived. Inadequate maternal immunization, unsterile delivery and inappropriate umbilical cord care are major contributing factors of neonatal tetanus in our study. Supportive measures are the mainstay of treatment in our setting with very limited resources.

KEY WORDS:

Neonatal tetanus, Risk factors, Management

INTRODUCTION

Neonatal tetanus is a serious disease caused by a toxin of *Clostridium tetani*, an ubiquitous spore-forming bacterium found in high concentrations in soil and animal excrement¹. Neonatal tetanus is associated with nonsterile delivery and umbilical cord care practices, and newborns of mothers with antitoxin levels insufficient to protect the newborn by transplacental transfer of maternal antibody².

With the discovery of tetanus toxoid as a means for active immunization in 1924, tetanus has since been a vaccine-preventable disease³. Despite the availability of universal vaccination, the total number of deaths caused by tetanus worldwide in 2002 was estimated at 213,000, of which neonatal tetanus was estimated to represent about 180,000 (84.5%)⁴.

Although Malaysians enjoy good health services including access to a fully subsidized childhood immunization programme as well as modern delivery services, isolated cases of neonatal tetanus are still being reported annually in the country. There were eleven cases of neonatal tetanus reported in Malaysia in 2006⁵. Of these, we report on five cases of neonatal tetanus diagnosed and managed in the Duchess of Kent Hospital, Sandakan which is a 323-bedded district hospital serving a population of 676,000 living within an area of 26,644 sq km⁶.

MATERIALS AND METHODS

All neonatal tetanus cases managed at Hospital Duchess of Kent, Sandakan between January 1st 2006 and December 31st 2006 were included in this retrospective study. Individual case notes were then retrieved and studied.

RESULTS

Demographic Data

Five cases (3 boys) of neonatal tetanus were seen during the study period. All patients were delivered at home by traditional birth attendants. The mother of one patient reported that the umbilical cord was cut with a shaving blade, another with a pair of scissors pre-cleaned with hot water. The others were unsure: two did not observe, another was merely the carer of an abandoned baby. The only Malaysian mother attended two antenatal visits, but was unable to recall receiving any injection. One Indonesian immigrant mother had one visit and also had an injection which she could not name, we postulate that it could be tetanus toxoid. The other two Filipino immigrant mothers had no antenatal care at all. We were unable to obtain any antenatal information for the abandoned baby.

Clinical features (Table I)

Median age at presentation was 9 days (range 5 to 17 days). The patients weighed between 2.36 to 3.20kg at presentation. Age at presentation ranged between 4 to 10 days (median 6 days) with limb stiffness as the chief complaint. Initial symptoms were fever and poor sucking, which were seen in all patients. The time from the onset of symptoms to the development of muscle spasms was reported as one day in four patients. One patient reported symptom onset at 5 days of age, but spasms only developed 7 days later. The umbilicus was reported to be dirty in three patients.

Laboratory investigations (Table II)

All umbilical swabs did not grow *Clostridium tetani*. Lumbar puncture was performed in patients who developed witnessed seizures in the ward, all cerebrospinal fluid (CSF) yielded no organism.

Treatment

Upon diagnosis, the patients were nursed in a dim, quiet environment with minimal handling and stimuli. We achieved this in our limited-resources setting with cloth-covered incubators. IV penicillin G (25000U/kg/dose q6hr for 14 days) and chlorhexidine dressing of the umbilicus were given to eradicate the source of toxin. No patient needed surgical debridement of the umbilicus. A single dose of 500U of intramuscular administration of tetanus immunoglobulin

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Table I: Clinical features of five patients with neonatal tetanus

Case	Weight (kg)	Nationality and ethnic group	Maternal antenatal visit	Age at presentation (days)	Fever	Poor sucking	Stiffness of limbs	Umbilicus
1	2.90	Filipino Bajau	No	4	Yes	Yes	Yes	Separated
2	3.20	Indonesian Bugis	1 visit	10	Yes	Yes	Yes	Dirty, foul smelling
3	3.01	Malaysian Bajau	2 visits	6	Yes	Yes	Yes	Pus discharge
4	2.60	Filipino Kagayan	No	5	Yes	Yes	Yes	Not recorded
5+	2.36	Filipino bajau	Unknown	8	Yes	Yes	Yes	Pus discharge

+ abandoned baby

Table II: Laboratory Investigation

Case	Hb (g/dl)	TWC (10 ⁹ /L)	Plt (10 ⁹ /L)	Na (mmol/L)	K (mmo/L)	Urea (mmol/L)	Sugar (mmol/L)	Umbilical Swab C&S	Blood C&S	CSF	Highest bilirubin (μmol/L)
1	23.1	18.9	240	144	6.2	6.9	6.1	Proteus mirabilis	No growth	No growth	255
2	15.1	12.7	483	132	4.4	4.5	14.3	Proteus mirabilis, Klebsiella spp.	No growth	Not done	Not done
3	17.1	14.5	407	150	6.1	12.3	4.0	Staphylo-coccus	Staphylococcus	No growth	Not done
4	13.9	16.5	418	170	5.1	20.9	5.4	No growth	No growth	No growth	286
5	9.67	17.3	738	157	5.7	13.6	5.4	Streptococcus pyogenes	No growth	Not done	287

Table III: Complications and outcome of five patients with neonatal tetanus

Case	Duration of ventilation (days)	Outcome	Duration of hospital stay (days)	Residual stiffness	Developmental milestones
1	14	Alive	44	No	Loss to follow up
2	0	Alive	25	No	Appropriate at 10wks
3‡	15	Alive	34	Yes	Head lag at 3 months of age
4‡	18	Alive	29	Yes	Loss to follow up
5	0	Alive	25	No	Loss to follow up

‡ discharged with baclofen

(TIG) was given to neutralize the unbound toxin. Control of muscle rigidity and spasm was attempted with diazepam infusion (0.1-0.3mg/kg/hour), with the addition of phenobarbitone (loading dose 20mg/kg, then 2.5mg/kg/dose q12hr, increased to max 5mg/kg/dose q12hr), chlorpromazine (1-5mg/kg/dose q8hr) and/or baclofen (0.2mg/kg/dose q8hr up to 40mg/day) based on the clinical response. Once muscle rigidity and spasm resolved, these drugs were then tapered down and taken off. Diazepam infusion was tapered first, followed by phenobarbitone, chlorpromazine and baclofen. Chest physiotherapy was done to remove excessive secretion secondary to disease autonomic effect and sedative effect of the medications. Nutritional intake was maintained enterally with tube feeding. Oral feeding was only commenced once spasms were fully-controlled with minimal sedation of the patient, and after re-establishment of good sucking reflex.

Complications and Outcome (Table III)

The most common complications were pertaining to the respiratory system, namely laryngospasm (1 patient), pneumonia (3 patients), secretion retention causing lung collapse (1 patient), apnoea (1 patient). Three patients required mechanical ventilation; with a median of 15 days (range 14 to 18 days). One of the three ventilated patients developed ventilator-associated pneumonia. One patient developed urinary retention while two patients had constipation requiring laxatives. All patients survived. The median duration of hospital stay was 29 days (range 25 to 44 days). Only two patients were discharged with residual stiffness, requiring maintenance baclofen. Three patients

defaulted follow up. One patient was reviewed at 10 weeks of age and her development was deemed appropriate at that time. Thereafter, her parents requested for review to be transferred to a local health clinic for socio-economic reasons. Only one patient was seen three months after discharge. He was assessed to be normotonic but had persistent head lag; which could be attributed to his then ongoing baclofen use. After weaning baclofen, he however did not attend further assessment hence definitive conclusion was deterred.

DISCUSSION

Risk factors for neonatal tetanus in this study relate to prenatal, perinatal and neonatal factors. Antenatally, the mothers in our study fail to obtain immunization with tetanus toxoid. Lack of awareness, financial constraints, language barrier and difficult access to medical services are major factors of their ignorance to antenatal care and hygienic deliveries. Traditional birth attendants who are known as '*bidan kampung*' in the local language, commonly attend childbirth. From a study in rural Malaysia, it has been estimated that the mortality rate from neonatal tetanus among births attended by untrained *bidan kampung* is about 34 per 1000 live births⁷. Umbilical cord is cut by unsterile instrument. Application of *kunyit* powder (tumeric) to umbilical cord and wrapping with cloth is a deep rooted practice and ritual among residents of rural Malaysia. This practice is believed to "keep the wind out"⁷. There is a suspicion that neonatal tetanus is under-reported. The disease was thought in certain community to be due to an evil spirit, the *Hantu Sawan*, which can be cured by marking a

cross on the door of a room and on the forehead of the mother and children⁷. This cultural belief prevents mothers for seeking medical advice and thus contributes to under-reported cases.

The diagnosis of neonatal tetanus is typically made clinically because of the difficulty in isolating *Clostridium tetani* which has fastidious growth requirements. None of the umbilical wound cultures from our study grew *Clostridium tetani*. However, wound cultures are positive for *Clostridium tetani* in only 30% of documented cases⁸. Therefore, tetanus is essentially a clinical diagnosis, growth of *Clostridium tetani* is not a criteria. Neonatal tetanus is commonly generalized. Incubation time is within 14 days of inoculation in most patients⁹. Initial symptom is rigidity in facial muscles hence poor sucking and feeding, with subsequent progression to the neck, trunk and limbs⁹. The WHO definition of neonatal tetanus is an illness occurring in a child who has the normal ability to suck and cry in the first two days of life but who loses this ability between days three and 28 of life and becomes rigid and has spasms¹⁰. All of our patients demonstrated the characteristic clinical features and met WHO definition of neonatal tetanus.

The specific objectives of neonatal tetanus are to stop the production of toxin with appropriate wound care and antibiotic use, to neutralize circulating toxin with tetanus immunoglobulin and to provide effective management of muscle spasm. Though the spores are highly resistant to temperature extremes and disinfectants, *Clostridium tetani* is sensitive to many common antibiotics¹¹. Penicillin G is the antibiotic of choice because of its effective clostridiocidal activity and its diffusibility¹².

Evidence to support the choice of pharmacological interventions in controlling muscle spasm in tetanus is lacking; literatures on this subject have been limited to opinions and anecdotal reports. The literature for neonatal tetanus is even more scarce. Diazepam infusion was chosen as our first line sedative and spasm control. Other medications used in the management of neonatal tetanus include chlorpromazine, phenobarbitone and baclofen. Combination of diazepam infusion and phenobarbitone has been shown to reduce the need for mechanical ventilation and the mortality^{13, 14}.

Patients surviving the initial acute phase of tetanus, however, face problems like pneumonia and nosocomial infections¹⁵. The prolonged intensive care required places extra demand on an already stretched healthcare budget¹⁶. Assessment of long term outcome was limited by poor attendance for follow up in our study. Brain damage reported after neonatal tetanus includes microcephaly, mild neurological abnormalities, developmental impairment and behavioral problems^{17, 18}.

Prevention of neonatal tetanus is possible through maternal immunisation during pregnancy and improvement of birth practices. Owa *et al*¹⁹ showed that although neonatal tetanus could occur in babies of mothers who had tetanus toxoid immunisation during pregnancy, maternal immunity could improve the prognosis of the baby. In Malaysia, primigravida should receive at least two doses of tetanus vaccine at least four weeks apart, with the first dose given after quickening²⁰. For subsequent pregnancies, a booster dose is given in third trimester or before 37 weeks²⁰.

Routine immunization programs still under serve large areas of developing countries due to logistical, cultural, economical and other reasons²¹. Since 1989 a "high risk approach" has been adopted by WHO to target all women of child bearing age living in high risk areas for immunization with three doses of a tetanus toxoid containing vaccine, implemented as "supplemental immunization activities" (SIAs)²².

CONCLUSION

Neonatal tetanus remains an important disease in Sandakan. Inadequate maternal immunization, unsterile delivery and inappropriate umbilical cord care are major contributing factors of neonatal tetanus our study. Supportive measures are the mainstay of treatment.

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