

Neonatal Tetanus, Yet Not Gone: Infectious Disease Hospital Experience

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Abstract

Background: Although neonatal tetanus (NT) has been declared eliminated from Bangladesh in June 2008, it is not uncommon in Infectious Disease Hospital (IDH) in Dhaka. There are various presentations of NT cases and treatment practices also vary. **Objective:** This study was conducted to describe our experiences with NT at IDH outlining the clinical characteristics, maternal immunization and treatment outcome. **Materials and Methods:** Thirty neonates admitted with tetanus in IDH from March 2011 to December 2012 were observed prospectively to study risk factors, clinical features and outcomes during hospital stay. **Results:** Among 30 neonates with tetanus 80% were male. Eighty seven percent of these cases were delivered at home and 83% of mothers did not receive any dose of tetanus toxoid (TT). Fifty percent of the neonates were admitted within 3–5 days of age. Shidur (Vermillion) was applied to the cord stump in 23% neonates. Hot soak was applied to the umbilicus in 5 (17%) neonates. Presenting features were convulsion and/or stiffness or rigidity (93%), inability to suck (90%) and umbilical infection (70%). During hospital care multiple cardiac arrests developed in 86% neonates and apnea developed in 60% of the neonates. Treatment was given in pediatric ward. Case fatality rate was 50%. **Conclusion:** Risk factors observed in NT cases were maternal non-immunization, unhygienic delivery practices and application of substances in the umbilicus. Antenatal TT administration and universal immunization under school health program should be more emphasized to prevent NT.

Key words: Neonatal tetanus; Maternal immunization; Infectious disease

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Introduction

Bangladesh achieved neonatal tetanus (NT) elimination status in June, 2008.^{1,2} Expanded Program on Immunization (EPI) reported 109 neonatal tetanus cases in the year of 2012.³ According to the Global Advisory Group, NT is one of the most underreported diseases. Though active and passive reporting system of vaccine preventable diseases has been improved a lot in our country, still there are chances of underreporting.

Tetanus spores are found throughout the world in soil and the stool of people and animal. Human exposure to tetanus spores cannot be completely prevented.⁵ According to Bangladesh Demographic Health Survey

(BDHS) in 2011, 32% of the pregnant women in our country did not receive any antenatal care.⁶ Seventy one percent of the deliveries were at home and 57% of the deliveries were assisted by unskilled birth attendants or relatives.⁶ It is evident that we could not ensure safe birth and safe cord care for all neonates. Maternal immunization with tetanus toxoid (TT) remains the cornerstone for control of NT. According to EPI, around 94% of the pregnant women in 2013 were vaccinated with TT (6% left nonimmunized).^{2,3} Due to the interwoven dual factors of maternal nonimmunization and unsafe delivery and/or cord care we are getting cases of NT in Infectious Disease Hospital (IDH).

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Various practices and presentations are observed worldwide in NT cases. Every neonate with tetanus usually presents in critical condition. Case fatality rate (CFR) of NT cases in developing countries remains high even in centers with intensive care services.^{7,8} Managing the neonates with tetanus is a challenge to us as to the physicians in other developing countries.

This study was conducted to describe our experiences with NT at IDH outlining the clinical characteristics, maternal immunization and treatment outcomes of NT cases in our environment.

Materials and Methods

This prospective study has been done over a period of 1 year and 10 months (March 2011 to December 2012) at IDH. Thirty NT cases were studied as a part of the bigger study on tetanus in all age groups. A neonate was diagnosed as a case of tetanus when he/she had the following signs and symptoms occurring in sequence: history of normal suck and cry for the first two days of life; complaints of onset of illness between 3 and 28 days of age; inability to suck; stiffness and/or convulsions.

A detailed medical history was obtained. Other relevant data included the social status (classified according to Bangladesh Bureau of Statistics)⁹ of the parents, immunization status of the mother, the status of the person who conducted delivery (midwife or traditional birth attendant), the place of delivery, the condition of the cord, if any stump, how the cord was cut and what was applied to the cord. Regarding the treatment, all patients received human tetanus-specific immunoglobulin, and antibiotics. Diazepam and phenobarbital were administered to control convulsion and for sedation. Intravenous fluids were continued until the neonates became stable. With the improvement of spasms, nasogastric tube feeding was commenced with expressed breast-milk, followed gradually by spoon-feeding and finally breastfeeding. On discharge, parents were advised about routine immunization as per the EPI. Examination findings, progress, complications and immediate outcome were recorded.

Clinical characteristics and variables were noted on a standard case record form. A descriptive analysis was done on all variables to obtain a frequency distribution. The mean \pm SD was calculated for quantitative variables. Tables and charts were then made to summarize the various data of interest.

Results

The neonatal tetanus cases in this study were 7% of all the tetanus cases in all age groups. There were 30 neonates (24 boys and 6 girls). Twenty six percent neonates were either from poor or from below average socioeconomic status. The mean age of the neonates was 6.8 ± 2.4 days on admission with a range of 4–21 days. Sixty three percent of the neonates had normal birth weight (≥ 2500 gm) and mean birth weight was 2800 ± 235 gm. Eighty six percent of the patients were from rural areas (Table I).

Eighty seven percent neonates were delivered at home and 73% were delivered by untrained traditional birth attendants or by relatives (Table II). In 63% cases either the blade was used to cut the cord or the thread was unboiled (unsterile). Eighty seven percent mothers did not receive any tetanus toxoid during their pregnancy.

Various substances were applied to the cord. Those were shidur (Vermillion, Lead oxide), turmeric, talcum powder and application of hot soak (Table II). The most common presenting symptoms and signs were spasticity and/or convulsion (93% each), inability to suck (90%), locked jaw (80%), umbilical infection (70%), fever (40%) and inconsolable cry (40%) (Table III). All the neonates were treated in the pediatric ward as there was no intensive care unit in IDH. Drugs used for treatment are shown in Table IV. Common complications were cardiac arrest (86%), aspiration pneumonia (66%), septicemia (40%) and apnea (60%). The overall hospital mortality rate was 50%, with most deaths occurring within the first week of illness. Among alive neonates shortest duration of hospital stay was 10 days and longest 31 days, with mean of 23 ± 2 days (Table V).

Table I: Characteristics of study neonates (n=30)

Characteristics	Categories	Number (%)
Sex	Male	24 (80)
	Female	06 (20)
Weight	<2500 gm	11 (37)
	≥ 2500 gm	19 (63)
Residence	Rural	26 (86)
	Urban	04 (14)
Socio-economic status	Poor	16 (53)
	Below average	10 (33)
	Average	04 (14)
Age at presentation in days	3–5	17 (56)
	6–10	07 (23)
	>10	06 (20)

Table II: Risk factors observed in neonates (n=30)

Variables	Category	Number (%)
Place of delivery	Home	26 (87)
	Hospital	04 (13)
Delivery attended by	Skilled attendants	08 (24)
	Relatives or unskilled attendants	22 (73)
Umbilical cord cut and tie	With boiled/sterile blade and thread	11 (37)
	With unboiled blade and thread	19 (63)
Substance applied to the umbilical cord	Shidur (vermillion)	07 (23)
	Talcum powder	04 (13)
	Turmeric	02 (07)
	Hot soak	05 (17)
	None	12 (40)
Maternal immunization	Not done	25 (83)
	Incomplete dose	01 (3.3)
	Complete dose	04 (13)

Table III: Clinical features of neonates at presentation (n=30)

Features	Number (%)
Convulsion	28 (93)
Stiffness/Rigidity	28 (93)
Inability to suck	27 (90)
Locked Jaw	24 (80)
Umbilical infection	21 (70)
Inconsolable cry	12 (40)
Fever	12 (40)

Table IV: Drugs used for treatment of neonates (n=30)

Drugs	Number (%)
Tetanus immunoglobulin	30 (100)
Inj ceftazidime	19 (63)
Inj metronidazole	19 (63)
Inj C penicillin	11 (37)
Inj diazepam	30 (100)
Inj phenobarbital	30 (100)

Table V: Complications, immediate outcomes and duration of hospital stay

Variables	Category	Number (%)
Complications (n=30)	Cardiac arrest (multiple)	26 (86)
	Aspiration pneumonia	20 (66)
	Septicemia	12 (40)
	Apnea	18 (60)
Outcomes (n=30)	Death	15 (50)
	Recovery	15 (50)
Duration of hospital stay in days (n=15)	≤ 20	06 (40)
	21–30	07 (47)
	>30	02 (13)

Discussion

Government of Bangladesh has a successful effort for prevention of NT and has declared elimination of NT. In IDH we got 30 neonates over a period of 22 months. Though we have good surveillance system for vaccine preventable diseases, still there are chances of underreporting. Though the condition described in previous study¹⁰ done 22 years back has been improved a lot, still many neonates are taken to traditional healers for any convulsion or spasticity. Many neonates with illness may not reach the health care facilities. Surveillance systems do not capture those NT deaths that occur at home and those for whom medical care at a hospital was not sought.^{11,12} Even in hospitals there are chances of underreporting.¹⁴ True extent of the tetanus death toll is not known in developing countries as many newborns and mothers die at home and neither the birth nor the death is reported.¹³

We have found male predominance among NT cases as observed previously, in both hospital-based and community-based studies. Some authors have suggested that males are more sensitive to the tetanus toxin than females.^{14,15} Nevertheless, the predominance of male cases in our study might also reflect an increased likelihood of taking more care of sick male neonates. One study conducted in China verified that female children were less likely to be brought to see a doctor when ill than male children and more than half of female children did not receive any health services from illness onset to the 24 hours prior to death.¹⁵

Tetanus is an entirely preventable disease through the use of tetanus toxoid. Tetanus spore is present in the environment and we cannot prevent the exposure. Easier method to protect the neonate from tetanus is to immunize the mother so that the fetus can get the antibody.¹⁶ In our study we observed 83% of the mothers were not immunized with TT. According to Demographic Health Survey⁶ in 2011, 32% of the pregnant women did not undergo any kind of antenatal check-up. So, being vaccinated with TT is unlikely for those women. EPI fact sheet showed 6% of the pregnant women were left non-immunized.³ Though the number is small, the absolute number becomes a large one (the population is huge) and every woman of them or the neonate remains at a great risk of tetanus. Many studies observed the similar findings of maternal non-immunization.^{7,8} A study conducted in Khyber Pakhtunkhwa (KPK) province of Pakistan, 65% of women in urban areas were vaccinated.¹⁷ The reasons cited for low immunization in KPK were lack of awareness, low literacy, low accessibility and misconceptions regarding immunizations. These conditions were also significantly associated with poor socioeconomic conditions of the province.

Among the NT cases we observed delivery at home, conducted by untrained attendants. It has been found that home delivery attended by family members or relatives placed the neonates at extremely high risk of NT.¹⁵ Such deliveries were associated with an independent 64-fold increased odds of NT compared with hospital delivery.¹⁸ Similar study performed in our country revealed untrained birth attendant and lack of hand washing as two of the most significant risk factors.¹⁰

We observed that 60% of our neonates had at least one substance applied to the cord. In comparison to other Bangladeshi study¹⁰ we found no neonate with cowdung application. Despite of having a clean and safe birth application of substances might be the way of contamination of the cord. In studies done in Nepal it is shown that application of mustard oil and other substances (breast milk, saliva, water, other oils, herbs, spices, curry) increased the risk of infection.^{19,20} Different studies in Pakistan have shown unsterile practices such as application of dirt or other traditional substances like ghee (clarified butter) to the umbilical stump may increase the risk

of NT even if the delivery was clean.^{7,8,21} Chai et al¹⁵ showed that proper cord care following delivery is important even for neonates born in hospitals.

In some of our neonatal tetanus cases there was safe delivery and cord care and the source of tetanus could not be identified. Chalya et al²² and Feroz & Rahman²³ in their studies observed that in some patients no portal of entry for the organism could be identified.

With specific and intensive therapy for neonatal tetanus, CFR has been reported to range from 25 to 90%.¹⁸ The CFR was found to be 50% in our patients. In their survey in a district of Pakistan, Quddus et al²⁴ found the CFR 62% among 43 NT cases admitted to the district hospital. The overall CFR among NT babies and mean duration of hospital stay in our study was similar to the rates previously reported in other parts of the developing world.^{7,8} Certain complications like cardiac arrests, apneic attacks, aspiration pneumonia observed in our study are similar to those of other studies.^{22,23} These complications could be managed better in intensive care setting which is lacking in our hospital. The mortality rate also could be improved if the neonates were taken care in intensive care unit.

From this study we can conclude that maternal non-immunization, unhygienic delivery practices and application of substances in the umbilicus have relation with the occurrence of NT cases. All the neonates with tetanus should be treated in intensive care units. For prevention of NT, it is of critical importance that the health workers should go for home visit and should provide TT vaccinations to the pregnant women and also inform them of the components of clean delivery and post-delivery practices, especially umbilical cord care and discourage harmful traditional practices. School-based Universal Immunization against tetanus can be a suitable delivery strategy for controlling NT.

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