

## ORIGINAL ARTICLE

### NEONATAL TETANUS: CASE SERIES FROM DILLA UNIVERSITY REFERRAL HOSPITAL, ETHIOPIA

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#### ABSTRACT

**Background:** Neonatal tetanus is a deadly infection leading to 7-8% of neonatal mortality in developing countries. WHO defines Neonatal tetanus as an illness in a child who has the normal ability to suck in the first 2 days of life, presented with failure to suck between 3rd and 28th days of life and has rigidity and spasms? Though Ethiopia declared maternal and neonatal tetanus elimination in 2017, there has been significant number of neonates presenting with this problem in Neonatal ICU's

**Methods:** This review characterized clinical profile, demography and outcome of seven neonatal tetanus cases admitted at Dilla University hospital, neonatal ICU from September 11, 2018 to September 11, 2020.

**Results:** All mothers gave birth at home with unskilled birth attendant, local blade or knife was used to cut the cord. Median age for mothers was 26 years and two out of seven had antenatal care (ANC) follow up and took Two doses of tetanus toxoid (TT) vaccine. Fever, failure to suck, spasm and convulsions were the common presenting symptoms. The overall mortality was 70%.

**Conclusion:** Continuous emphasis on antenatal tetanus immunization and safe delivery practices should be maintained. Clinicians caring for neonates should be aware of the presentations of neonatal tetanus to allow them to diagnose these patients early and initiate appropriate lifesaving management.

**Keywords:** Neonatal tetanus, case series, resource limited setting

#### Background

Four different forms of tetanus are described; local, cephalic, generalized and neonatal. Neonatal

tetanus is a form of generalized tetanus caused by a toxin producing bacteria *Clostridium tetani*, which is gram-positive spore-forming

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anaerobe(1). An infant who has not acquired passive immunity because the mother has never been vaccinated is at risk.

Neonatal Tetanus is most often occurs through cutting of the umbilical cord using non-sterile techniques or applying non-sterile traditional remedies to the umbilical cord stump, but infection of the umbilical stump is not always evident.

A confirmed case of neonatal tetanus is defined by World Health Organization (WHO) as a child with a history of all three of the following: [a] Normal feeding and crying during the first 2 days of life; [b] onset of illness between age 3 and 28 days; and [c] inability to suckle (trismus), followed by stiffness and/or spasms(2).

There are different types of disease severity scoring systems which predicts outcome; the Phillip score, Dakar score and Ablett classification(3). Presence of respiratory distress, tachycardia, late presentation to health facility from time of onset, severe trismus and prolonged spasms are found to be indicators of severe disease or poor prognostic signs (4,5). An ideal score will differentiate those at risk of poor outcome soon after admission. Dakar score is easy to apply but Ablett classification has high predictive value.

Mass Neonatal Tetanus elimination initiative set the initiative of achieving  $\geq 80\%$  coverage with  $\geq 2$  doses of tetanus toxoid containing vaccine (TTCV) among reproductive women, achieving skilled birth attendance of  $\geq 70\%$

and enhancing surveillance for neonatal tetanus (NT) cases. Even in 2018, only 47% of the 59 high priority countries achieved  $>70\%$  skilled birth attendant (SBA) (6).

Ethiopia becomes one of the 42 countries who eliminated neonatal and maternal tetanus. Elimination is achieved when  $<1$  case occurs in 1000 live births in every district across the country. In 2018 the country reported only 14 cases and has achieved 84% coverage of 2 doses of tetanus vaccine for reproductive age women. However Ethiopia's coverage of SBA is 16%, the lowest from the 59 high neonatal and maternal tetanus burden countries (6).

The case-fatality rate of NT without treatment approaches 100%, though with intensive care this can be decreased to 10–20% (7). In 2018, neonatal tetanus accounted for 1% of major causes of neonatal deaths, a significant decrease compared with a 7% contribution to all-cause neonatal mortality in 2000 (8).

Admission to a dark and quiet room, muscle spasm and rigidity control, autonomic dysfunction control, ventilator support when needed, neutralization of tetanus toxin, wound management, and antibiotics are some of the principles of tetanus management(9).

In a study done in Ethiopia, the case fatality rate was 29.2%. The majority of patients in this study had mild to moderate tetanus, and the result was bad in higher grades(10). Though Ethiopia declared maternal and neonatal tetanus elimination in 2017, there has been significant number of neonates presenting with this problem in Neonatal intensive care units

(ICU's). According to global health observatory data, the number of cases in 2018 was 14 but in 2019 it peak to 107 and 45 in 2020 (11). Most of the NT cases and the majority of deaths occur in remote parts of the country and studies are not done to show the magnitude and clinical profile of neonatal tetanus cases in Ethiopia. Hence this paper helps to characterize the cases found from this part of the country.

## Methods

### Study setting

The study was conducted at Dilla university Hospital. It serves as a referral center for the people in Gedeo, Sidama, Guji and Borena zones, with estimated population of 1.5million (12). The Hospital has many departments and units. The pediatrics department is one of the departments composed of emergency unit, inpatient wards and neonatal ICU. The neonatal ICU has 30 beds with average of 120 patients being admitted per month.

### Data collection

According to WHO a neonate is said to have confirmed neonatal tetanus if the neonate present with normal ability to suck and cry during the first two days of life; AND — could not suck normally between 3 and 28 days of age; AND — developed muscle stiffness and/or spasms(13). Neonates with admission diagnosis of neonatal tetanus from September 11 2018 till August 11, 2020 were included in the study. Medical records were retrieved from record office and data on demography, clinical presentation, course, treatment and outcome

were.

The case series received approval of the Institutional Human Research Ethics Committee of Dilla College of medicine and health science institutional review board (IRB).

## Results

Patients were managed based on Ethiopian NICU training manual(14). All neonates were managed by isolating to dark room. They were given tetanus antitoxin 750 IU intramuscular (IM) and intravenous (IV), stat. Ampicillin and gentamycin was initially started and continued for 14 days as meningitis was difficult to rule out because of patients critical condition. Metronidazole IV was also given for 7 days (Metronidazole is a safe alternative to penicillin, and may now be considered as the first line therapy)(15). Diazepam 0.2mg/kg Q4 hours was started initially then escalated up to Q1 hour and for some even continuous diazepam was given. Chlorpromazine (CPZ) 0.5mg/kg/dose po bid was also added when spasms persisted. Phenobarbital of 10mg/kg po loading then 5mg/kg maintenance was given for case 1 and case 6. Immunoglobulin and facilities for mechanical ventilation were unavailable during the period of the study.

There were seven (n=7) cases of neonatal tetanus admitted over the study period, five of them females and 2 males (Table 1)

Most of the neonates had failure to suck, fever and spasms at initial presentation. Case 7 presented with abdominal distension and vomiting after parents gave traditional medicine when the child fails to feed breast.

The median age at admission and symptom onset were 4.7 days and 3.7 days. Five of the

seven neonates died most of them in the first 2 days of admission.

Table 1: Neonatal tetanus: case series in resource limited setting; the new-born's medical profile

Characteristics	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Gender	Female	Female	Female	Male	Female	Female	Male
Age at admission (days)	5	3	4	5	6	5	5
Age at onset of symptoms(days)	3	2	4	4	5	4	4
Dakar score	3	5	5	5	2	2	4
Duration of hospital stay(days)	2	13	29	11	2	2	3
outcome	Death	Discharged improved	Discharged improved	Death	Death	Death	Death

All the mothers were illiterate, median age 26 years and were from the poor socioeconomic background (Table 2). Three out of seven mothers had ANC follow-up, however only 2 of them took 2 doses of TT vaccine. All of

them delivered at home (no reason given in the document). Cord was cut by using blade for almost all cases except one were the cord was cut by knife.

Table 2: Maternal characteristics of a case series of neonatal tetanus in resource limited settings, 2021

Characteristics	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Maternal age	20	26	28	25	30	30	25
Residence	Urban	Rural	rural	Rural	Rural	Rural	Rural
Gravidity	1	3	6	2	5	5	2
ANC follow-up	No	Yes	No	No	Yes	Yes	No
TT vaccine 2X	No	Yes	No	No	Yes	No	No
Mode of delivery	SVD	SVD	SVD	SVD	SVD	SVD	SVD
Place of delivery	Home	Home	Home	Home	Home	Home	Home
Material used for cutting UC	Local blade	unknown	Knife	Local blade	Local blade	Local blade	Local blade

## Discussion

Seven neonatal tetanus cases seen in this cases series were all delivered at home with no SBA. Most mothers didn't take TT vaccine at current or previous pregnancy. Neonates began to develop symptoms early in life and overall outcome of the admissions were poor.

Due to the poor socioeconomic status, maternal illiteracy, and low community awareness, the mothers in this study failed to take complete antenatal care, and/or the tetanus toxoid injections. Non sterile material use (nonsurgical blade, or sometimes knives) were common in low socioeconomic areas. Mothers with a primary or higher level of education, media exposure and having an ANC visit, had significantly higher odds of having a protected birth against NT(16).

In addition incentive programs for institutional delivery, providing safe delivery kit have paved the way for maternal and neonatal tetanus elimination in India(17)

Mothers of Case 2, case 5 and case 6 had regular antenatal care and two of them (case 2 and case 5) had taken two doses of tetanus toxoid but still their baby developed tetanus. Similar study done in Kenya and Nigeria reported cases of neonatal tetanus that had detectable levels of anti-tetanus antibodies and their mothers were immunized(18,19). The probable causes of these cases include errors in the dosing interval, poor maternal immune response, maternal HIV, vitamin A deficiency and maternal malaria infection. Data on these factors were unfortunately not available in this

study but these should be considered in ongoing efforts to eliminate neonatal tetanus.

All the cases did not have any significant clinical event until after few days of life (median of 3.7 days and mode of 4). Most of our neonates had persistent spasms, fever and respiratory distress. Shorter incubation periods (<7d) are usually associated with protracted and more severe neonatal tetanus(3). Also according to Ablett classification occurrence of severe trismus, generalized rigidity, prolonged spasms, severe dysphagia, apneic spells, pulse >120 beats/min and respiratory rate >40 breaths/min were associated with severe disease (4).

In this series the mortality from neonatal tetanus was 70%, which exceeds the average mortality from neonatal tetanus of 50%(18).

Many studies demonstrate improved outcome of neonatal tetanus after introducing a bundle of care. In Ugandan study, the mortality rate was reduced from 84.6% to 25.0% ( $P=0.02$ ), after introduction of a protocol that suggest magnesium sulphate and diazepam continuous infusions, broad-spectrum antibiotics and bCPAP (20,21)

In a study on eleven cases of neonatal tetanus in Malaysia, all the neonates discharged improved. Early endotracheal intubation and the availability of mechanical ventilation were the main reason for the excellent survival (22).

## Conclusion

Neonatal tetanus is a rare disease, with high mortality. The incidence of neonatal tetanus is surging in recent reports, hence continuous

emphasis on antenatal tetanus immunization and safe delivery practices should be maintained. Clinicians caring for neonates should be aware of the presentations of neonatal tetanus to allow them to diagnose these patients early and initiate appropriate lifesaving management. As seen in many studies above, the use intensive neonatal care using mechanical ventilation and magnesium sulphate will increase the survival. Proper guidelines including these management options should be drafted and practiced across all NICU settings.

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