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Two cases of neonatal tetanus at a teaching hospital in Ghana: Public health implications

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Abstract: Globally, the incidence of neonatal tetanus has been on the decline over the past 2 to 3 decades, with the cases identified coming mostly from developing countries, especially in countries with poor health infrastructure.

Neonatal tetanus tends to occur as a result of lack of or inadequate tetanus immunizations during the mother's reproductive life, unhygienic delivery practices or poor umbilical cord care practices.

We present sociodemographic and clinical data and short-term outcomes of two cases of neonatal tetanus that were managed in a tertiary hospital in Ghana. The

mothers of both babies had inadequate antenatal care, and both delivered at home with the help of untrained Traditional birth attendants. Both babies were referred from the same district level hospital, and survived without the need for mechanical ventilation.

Ethical approval was obtained from the Komfo Anokye Teaching Hospital Institutional Review Board, and informed consent sought from the mothers of both babies.

Key words: neonatal tetanus, tetanus elimination, neonatal mortality

Introduction

Tetanus is an often-fatal acute condition caused by the gram positive bacterium *Clostridium tetani* which is a spore forming anaerobe found in soil and in the intestines of humans and animals.¹ Transmission occurs when the tetanus spores gain access through a compromised skin integrity or via the unhealed umbilical cord stump of a newborn.²

Neonatal tetanus is still a recognized leading preventable cause of neonatal mortality, especially in developing countries³ and remains a global health problem. It is estimated that about 50,000 neonates and infants die as a result of tetanus annually.⁴

The World Health Organization (WHO) defines a confirmed case of neonatal tetanus as any case that meets the following criteria; normal ability to suck during the first two days of life, loss of ability to suck normally between days 3 and 28 of life, and develops muscle stiffness and or spasms. According to WHO, there was a 96% reduction in neonatal tetanus cases between the years 1988 and 2015,⁵ and a reduction of 88% in the number of newborns that died from tetanus between 2000 and 2018,⁶ representing remarkable global progress towards achieving the maternal and neonatal tetanus elimination (MNTE) goal.

There are several recognized risk factors for neonatal tetanus, and these include low maternal immunization rates, inadequate or lack of proper antenatal care in a hospital setting, unsafe and unhygienic delivery practices, and application of traditional remedies to the umbilical cord stump soon after birth.⁵

Mortality from neonatal tetanus is very high, almost 100%, in the absence of medical care, however, it drops to 10 – 60% when managed in the hospital, depending on the level of intensive care facilities available.^{7,8} The role of intensive care facilities cannot be underplayed in the care of critically ill newborns,⁹ however, in most low and middle income countries, health infrastructure especially for neonatal intensive care, are lacking, explaining the high rates of mortality from neonatal tetanus in these settings.¹⁰ Lawn *et al* estimated that neonatal tetanus, together with pneumonia/sepsis and diarrhea contributed 35% of neonatal deaths globally in 193 countries.¹¹ This case series describes the presentation, management and short-term outcomes of two cases of neonatal tetanus from the same district at a tertiary hospital in Ghana.

Case Series

Two cases of neonatal tetanus were managed at the Neonatal Intensive Care Unit (NICU) of the Komfo Anokye Teaching Hospital (KATH) in September and October 2020. Both cases were referred from the same district level hospital a day apart and presented with poor feeding, lethargy and fever.

Mothers of both babies were farmers and came from poor socioeconomic backgrounds earning less than \$50 on a monthly basis, with none completing secondary level education. Mothers characteristics are summarized in Table 1.

Table 1: Maternal Characteristics of two cases of Neonatal tetanus

Characteristics	Case 1	Case 2
Residence	Rural	Rural
Level of Education	Secondary	Primary
Marital Status	Cohabiting	Cohabiting
Occupation	Farmer	Farmer
Monthly salary (USD)	25	45
Gravidity	3	4
History of neonatal death	Died at 6 days of life	None
Age (years)	20	26
Antenatal Attendance	Irregular	Irregular
Mode of Delivery	Vaginal	Vaginal
Place of Delivery	Home	Home
Tetanus Toxoid	Yes (2 doses overall)	No

Table 2: Clinical data on two cases of Neonatal Tetanus

Characteristics	Case 1	Case 2
Age at onset of symptoms (days)	8	7
Age on admission (days)	16	12
Sex	Female	Male
Birthweight (kg)	3.3	2.7
Tetanus Immunoglobulin	Yes	Yes
Lumbar puncture	No bacterial growth	No bacterial growth
Medications	Crystallin Penicillin Metronidazole Gentamycin Phenobarbitone Chlorpromazine	Crystallin Penicillin Metronidazole Gentamycin Phenobarbitone Chlorpromazine
Blood culture	No bacterial growth	No bacterial growth
Mechanical Ventilation	Not done	Not done
Hospital Stay (days)	23	21
Outcome	Discharge	Discharge
Outcome at 6 months	No evidence of growth or neurological deficit	No evidence of growth or neurological deficit

Both cases were delivered at home by untrained Traditional Birth Attendants (TBAs), with the cords cut with blades whose sterility could not be determined.

Both mothers had all of their previous deliveries at home, and all the babies including index cases had herbs applied on their umbilical stumps soon after birth. Both babies were taken to a nearby health facility in the second week of life on account of poor feeding and lethargy before being referred to our center.

During admission, they were nursed in incubators in the isolation unit of the NICU, had negative blood cultures, and complications such as fractures, aspiration pneumonia and renal failure were not seen.

Both infants were followed up and determined to have normal growth indices and no evidence of neurological deficits at 3 and 6 months old. Clinical data on two cases are summarized in table 2

Discussion

Neonatal tetanus is an important cause of neonatal mortality, especially in Sub Saharan Africa and Southeast Asia, yet it is a preventable condition.¹²

Both mothers reported from rural areas which is typical of tetanus cases,² did not have the whole complement of antenatal care services, especially the tetanus immunizations, most likely due to their poor socioeconomic backgrounds and low levels of literacy. Although free maternal health policy including antenatal services was implemented in Ghana in 2008 and it's still operational, barriers to accessing the services still exist; such as poorly resourced peripheral health systems, and the need to make out-of-pocket-payments for certain services like ultrasounds and drugs.¹³

Mother of Case 1 had received only 2 doses of the tetanus toxoid in her reproductive life despite this being her third pregnancy, whereas mother of Case 2 had never received any. This is consistent with poor antenatal care being a well-recognized factor in the high incidence of neonatal tetanus in developing countries.^{14,15} A higher risk of neonatal mortality has been determined to be associated with mothers who did not receive the tetanus toxoid during pregnancy by Mekonnen *et al* from Ethiopia,¹⁶ and by Singh A *et al* in rural India.^{17,18} One systematic review identified that mortality from neonatal tetanus can be reduced by 94% if pregnant women or women in their reproductive age received at least 2 doses of the tetanus toxoid.⁷ However, although the mother of case 1 had received 2 doses of the tetanus toxoid, her baby was still exposed to other risk factors like the umbilical cord being cut with an unsterilized blade and certain herbs being applied to the cord soon after birth. A retrospective study done in a Nigerian University Teaching Hospital on tetanus revealed that almost 70% of the mothers had received no tetanus immunization, with 94.1% delivering at home and more than 50% of the babies affected presenting with the severe form of the disease.¹⁹

According to the Ghana Statistical Service (2014), as at 2008, the presence of skilled assistance by a Health Professional during delivery in rural Ghana was 59%,²⁰ hence it is not surprising that both mothers in this case series delivered at home. One study identified 28% of deliveries taking place outside a health facility in Ghana, with rural women having a lower probability of delivering in a health facility compared to urban women.²¹ Typically, women who do not receive skilled birth assistance during delivery are supported by TBAs or friends and family,²² and there are concerns that these deliveries are not done under sterile conditions. A recent study in Ghana also revealed 32% of women delivered at home without the presence of skilled birth attendants.²³ Nonsterile delivery practices by the untrained TBAs coupled with traditional/cultural practices of applying non-sterile substances and herbs to the umbilical cord stump are two major challenges faced by developing countries in maintaining their MNTE status. Almost

65% of mothers in one of the regions in Ghana was determined to apply substances that have not been prescribed by a health professional on the umbilical cord stump.²⁴ This emphasizes the role of certain traditional practices indirectly contributing to the high neonatal morbidity and mortality rates.

A study in India identified that babies with age of onset of symptoms before one week of life were 5 times more likely to die than those manifesting after a week or more.²⁵ These findings are very similar to that found in a systematic review that determined that if the age of onset is between 5 to 7 days, it increases the odds of the baby dying from neonatal tetanus.²⁶ This is consistent with the two cases being presented here as they both had onset of symptoms after the first week of life and both had good outcomes.

Average age of onset for both cases was 7.5 days which is consistent with the 7.2 days in one Nigerian study.²⁷ Although the typical presentation is the loss of the ability to feed between 3 and 28 days of life with an average of 7 days,^{2,5} Chatterjee *et al* in their case study reported the onset of muscle spasms, stiffness and seizures within the first 24 hours of life in an Indian baby.²⁸

Both cases did not require mechanical ventilation during their stay in the NICU, though there was the need for respiratory support in the form of non-rebreather masks in the initial days of admission. A good outcome for tetanus has significantly been associated with the availability of intensive care facilities including mechanical ventilation.²⁹ Unfortunately, neonatal tetanus tends to occur in countries with poor health infrastructure hence availability and access to such facilities is limited, and Ghana is no exception.

Both babies survived after staying in the hospital for 23

and 21 days for cases 1 and 2 respectively. Spasms from tetanus can typically last for about 2 – 3 weeks, with full recovery from the condition usually taking about 6 – 8 weeks.² Longer lengths of hospital stay tend to negatively impact hospitals, in terms of both human resource and infrastructure and equipment.

There is the need to improve education on the importance of antenatal care as well as safe delivery practices. TBAs need to be trained in safe birth practices. The 3-pronged approach of maternal and childhood immunization, promotion of safe and hygienic delivery practices as well as close surveillance of tetanus cases would go a long way in helping Ghana maintain its MNTE status. WHO recommends that even in the face of MNTE, routine monthly surveillance of neonatal tetanus must be done, including annual review of records at the major health facilities in order to identify high risk communities, including the affected district and measures promptly put in place to prevent escalation of the numbers, in addition to active surveillance and zero reporting.³⁰

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