



Short communication

Tetanus complicating snakebite in northern Nigeria: clinical presentation and public health implications[☆]

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Abstract

Background: There is inequality in vaccination coverage, and adult farmers in tropical rural communities could have missed tetanus toxoid as campaigns target children. Snakebite is not uncommon and partly because of lack of effective antivenom, management in inaccessible areas could be complicated with tetanus in unimmunized victims. **Patients and results:** Four snakebite victims who developed tetanus were seen in northern Nigeria. Three were bitten while farming and patients took 10–25 days before presenting to hospital. All patients had incised bite sites and applied local medicinal herbs and in one case, a black ‘snake’ stone. Bites were by the cobra (*Naja nigricollis*) and carpet viper (*Echis ocellatus*) in the extremities and victims had swollen limbs and bleeding with incoagulable blood. Three of the patients were given anti-tetanus serum (ATS) after development of tetanus symptoms in a primary facility and only one recalled receipt of one dose of tetanus toxoid prior to bite. Patients had trismus, rigidity, backache, spasms and one had autonomic dysfunction and was managed with antispasmodics, ATS, wound care, antibiotics and supportive measures. Two patients with envenoming and severe tetanus received antivenom, but died. One of the two surviving patients developed osteomyelitis with prolonged hospital stay, while the other recovered with residual disability. **Conclusion:** Tetanus could follow snakebite in inaccessible rural agricultural communities with inadequate health care provision. Clinical presentation is typical but late and is confounded by snakebite complications leading to considerable morbidity and mortality. The cases highlight the triple problems of inadequacy, inaccessibility and inequality in health care and calls for measures aimed at improvement.

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1. Introduction

Tetanus has decreased in prevalence in the tropics due partly to increased immunization coverage and improved health care delivery. The tetanus vaccine has been shown to be effective and safe (Bottiger et al. 1998). But rural communities,

particularly in tropical Africa, still have poor vaccination coverage for several reasons including inaccessibility, lack of cogent immunization policy and ignorance. These communities are at risk for tetanus and other afflictions prevalent in the tropics, such as snakebite.

For nearly half a century, snakebite has been recognized as an important global public health problem in rural and agricultural communities especially in the tropics (Swaroop and Grab, 1954). In some areas of northern Nigeria, the incidence of snakebite has reached up to 500 per 100,000 population per year and in certain parts of the region, >10% of hospital beds might be occupied by snakebite patients (Warrell and Arnett, 1976). With deterioration in the Nigerian health care system over the past two decades, proper case management of snakebite victims has been hindered by both lack of effective antivenom and the general poor state of health care delivery in the country and with waning public confidence in the system many unproven, ineffective, often time wasting and potentially harmful remedies are resorted to by victims of snakebite. Victims from these inaccessible areas often present to hospital many days after the bite and occasionally with secondary complications, such as tetanus. Tetanus could result from complications of poor wound management or contamination with applied traditional remedies. Here, we report on the presentation, management, outcome and public health aspects of patients with tetanus complicating snakebite from northern Nigeria.

2. Patients and results

We saw four snakebite victims who also developed tetanus in two university hospitals in northern Nigeria; three at Ahmadu Bello University Hospital, Zaria between 1990 and 1995 and one at Aminu Kano Teaching Hospital, Kano in 2000–2001 (see Tables 1 and 2). Three patients were bitten while farming. Patients took 10, 13, 19 and 25 days after bite, respectively before arrival to hospital. All patients had pain and swelling in the bitten limb and had incised bite sites and applied local medicinal herbs, and in one case, a black

‘snake’ stone (Rasquinha, 1996). A female patient was bitten by cobra (*Naja nigricollis*) in her left hand but the remaining patients were bitten in the legs, two (Patients 1 and 3) by carpet viper (*Echis ocellatus*) with a history of bleeding diathesis and one by an unidentified snake. Snakes were identified historically based on typical description of black, hooded, long snake in the case of the cobra and a history of local and systemic bleeding (dyscrasias) and documentation of incoagulable blood in the case of carpet viper bites, as described by Warrell and Arnett (1976). Three of the patients were given anti-tetanus serum (ATS) and tetanus toxoid (TT) in a primary health care facility only after development of tetanus symptoms and all had no proper immediate wound management of the bite sites. Only Patient 2 recalled prior receipt of one injection of tetanus toxoid or DTP before the bite. Three patients presented with fully developed tetanus, while the features were subtle and evolving in the fourth at presentation. All the patients eventually had trismus, rigidity, backache and spasms. Patient 3 had persistent tachycardia with non-specific ST changes on ECG. All patients were managed with diazepam, chlorpromazine, ATS, wound care, penicillin and/or metronidazole and supportive measures. Two patients received antivenom. Two patients bitten by the carpet viper died despite receipt of antivenom and both had frequent severe spasms every 15–30 min and relatively short periods of spasm onset. One of the two surviving patients developed osteomyelitis after fasciotomy and spent 45 days in hospital, while the other recovered but had residual stiffman syndrome on discharge.

3. Discussion

The clinical presentation of these tetanus patients was typical with rigidity, spasms, trismus and possible autonomic dysfunction with tachycardia in one, all following snakebite. The patients with known poor prognostic factors for tetanus (i.e. short times of incubation and period of onset and frequent spasms) also had snakebite systemic envenoming and eventually died. The presentation

Table 1
Characteristics and initial management of snakebite patients with complicating tetanus

Serial No.	Age (years)/sex	Site of bite	Circumstances of bite	Features of bite	Initial home intervention
1	37/M	Right foot	Farming	Swelling and bleeding*	Herbs
2	40/F	Left hand	Sleeping	Swelling	Herbs
3	64/M	Left leg	Farming	Bleeding	Herbs/black stone
4	50/M	Right leg	Farming	Mild swelling	Herbs

* Patient had incoagulable blood.

of envenoming in the victims was also typical with local swelling and bleeding with incoagulable whole blood in the confirmed carpet viper victims. In a MEDLINE search, we identified only two other cases of fatal tetanus complicating snakebite in a report of 46 snakebite deaths in Thailand (Looaresuwan et al., 1988). The two survivors presented here also had considerable morbidity with prolonged hospital stay. The high mortality of 50% was observed in patients who were even treated with antivenom and lack of immediate appropriate care, late hospital presentation and additive nature of the two ailments were partly responsible for the fatalities. The lack of prompt effective antivenom therapy might have also indirectly contributed. While calls for drug development for neglected infections have been made (Trouiller et al., 2001), snakebite has for long been a neglected health problem in agricultural com-

munities and the recent plea by Theakston and Warrell (2000) on the looming crises in snake antivenom supply for Africa needs to be acted upon, particularly in Nigeria where annually hundreds perish in the Savannah from snakebite. Lack of effective antivenom reduces public confidence in the health care system and further jeopardizes presentation to hospital for common complications, such as tetanus. Being a rural problem, snakebite victims end up resorting to the use of traditional remedies and incision of bite site often in an unhygienic manner with ensuing complications, as exemplified in the cases presented here.

Despite the excellent correlation between tetanus vaccination coverage and tetanus immunity and effectiveness (Gergen et al., 1995) and the vaccine's availability since the 1940s, many inaccessible populations in both developing and devel-

Table 2
Presentation, intervention and outcome of tetanus complicating snakebite

Serial No.	Incubation times (days)*	Period of onset (h)*	Frequency and severity of spasms	Hospital intervention ^a	Outcome
1	6	24	Severe spasms every \approx 15 min	ATS; TT; ASV ^b ; penicillin/metronidazole	Died
2	9	60	Moderate, every hour	ATS; TT; ampicillin/metronidazole	Survived after fasciotomy, osteomyelitis and 45 day stay
3	8	36	Severe spasms every \approx 30 min; dysphagia and difficulty in breathing	ATS; TT; ASV ^b ; penicillin	Died
4	15	96	Moderate, every 1–2 h ^c	ATS; TT; penicillin	Survived with residual stiffness

NB, ATS and TT were at different sites.

^a All patients also had supportive parenteral fluids (dextrose), chlorpromazine and/or diazepam.

^b ASV, polyspecific anti-snake venom: Patient 1 received Serum Institute of India (SII) and Patient 3 received Ipsier Afrique (Pasteur).

^c Tetanus features were subtle and evolving in this patient.

* Approximate times of incubation and onset of spasms.

oped societies have poor coverage. In this part of Nigeria, we found only one in four snakebite victims recalled prior receipt of tetanus toxoid or DTP before development of tetanus and none completed a tetanus toxoid course. They were rural farmers aged 37–64 years, who could have missed regular vaccination schedules, as immunization campaigns in Nigeria in the last two to three decades generally focus on children. A similar pattern has been recognized elsewhere, with vaccination coverage and tetanus immunity considerably less for adults older than 46–50 years compared to younger people (Centers for Disease Control, 1990; Svensson et al., 1998).

In Africa, most immunization programs focus solely on children and the age group 30–60 years, which provides the farmers, those at risk for injuries including snakebites, are therefore predisposed to tetanus with important medical and economic implications and efforts should be made to protect them by periodic vaccination. Even with a conservative estimate of one million snakebites causing over 20,000 deaths each year in Africa (Chippaux, 1998), prevention against tetanus in adult farmers and provision of effective antivenoms together with prompt primary wound care, including use of anti-tetanus measures (sera) for victims, should be viewed as a matter of great public health importance.

Tetanus is a well-known complication of any injury, but the above cases highlight the unique inter-relatedness of infectious and non-infectious diseases in developing countries. In this, there are similarities with minority inaccessible populations in some developed countries, where inequalities in health care delivery could promote infections, such as tetanus. As an example, immigrant Mexican Americans have considerably lower rates of tetanus immunity than other non-Hispanic Americans (Gergen et al., 1995) and recently Vugia (2001) reported on 40 cases of tetanus among mostly Hispanic intravenous drug users in California. In a sense, both the rural snakebite adult victim in the tropics and the immigrant intravenous drug user in the city are similar, with a primarily non-infectious affliction and low tetanus vaccination rate and immunity and both are at risk of developing tetanus, a vaccine-preventable infectious disease.

In conclusion, tetanus could follow snakebite in inaccessible rural agricultural communities, particularly in adult victims with no prior receipt of tetanus toxoid. Clinical presentation is typical but late, and is confounded by snakebite complications leading to considerable morbidity and mortality. The cases also highlight the different kinds of inadequacies and inequalities in health care provision and calls for measures aimed at improvement by provision of prompt bite wound care, effective antivenoms and tetanus prevention in bite wound management.

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